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# Cognitive and Temperament Predictors of Executive Ability: Principles for Developing Leadership Capacity

Michael D. Mumford, Stephen J. Zaccaro, Francis D. Harding,  
Edwin A. Fleishman, and Roni Reiter-Palmon  
Management Research Institute, Inc.

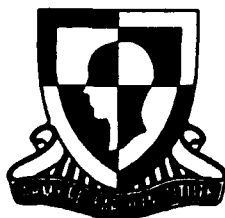
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13. ABSTRACT (Maximum 200 words) This report completes phase I of a small business innovative research effort to measure and enhance cognitive skills. Prior research suggests that effective application of cognitive capacities is a crucial requirement for high-level organizational leadership. Skill in solving ill-defined problems is also important. Because problem situations often require novel approaches, their solutions necessitate creative input. This report describes research to identify cognitive skill and temperament factors that contribute to executive performance and to develop measures for them. A taxonomy was developed that had 13 leadership behavior dimensions related to discretionary and creative problem solving. Three validation studies of this taxonomy were conducted. Sixty-five cognitive and temperament predictors of executive ability were derived from the taxonomy and organized into 11 dimensions: general cognitive intelligence, creativity, crystallized cognitive skills, adaptability/ego resiliency, openness/curiosity, self-awareness, achievement, need for dominance, commitment to social systems, practical intelligence, and social intelligence. Two studies of the validity of the taxonomy were done, the first using (Continued)				
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**EDGAR M. JOHNSON  
Acting Director**

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**Technical Report 977**

# **Cognitive and Temperament Predictors of Executive Ability: Principles for Developing Leadership Capacity**

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## FOREWORD

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Leader development must be a paramount concern for organizations with strategic vision. The future rests on the foundation of present development practice. In the U.S. Army, leader development is built on three pillars: institutional education and training, developmental assignments, and self-development initiatives. All three pillars require developmental benchmarks that define expectations at critical points for growth in the key knowledges, skills, and abilities (KSA) essential for effective performance and further growth.

The research described in this report is a first step toward an improved technology for aiding leader development. The fully developed technology will include well-articulated end goals--the terminal KSA toward which the development process aims, clearly defined intermediate goals--the level to which the KSA should have developed by each critical point in time, and reliable ways of assessing development against the intermediate goals.

Key end goals, defined as the critical knowledges, skills, and abilities required for effective performance at the top levels of the Army, have now been articulated, based on research involving the senior leadership. This report is the first step toward developing measurement technology for assessing key cognitive and interpersonal skills at intermediate development points, and determining what the development goals at those points should be.

This research is part of the U.S. Army Research Institute's Small Business Innovative Research work program.



EDGAR M. JOHNSON  
Acting Director

# COGNITIVE AND TEMPERAMENT PREDICTORS OF EXECUTIVE ABILITY: PRINCIPLES FOR DEVELOPING LEADERSHIP CAPACITY

## EXECUTIVE SUMMARY

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### Requirement:

A number of sources have documented the need for improvements in leader development programs in complex organizations, including the U.S. Army. Prior research suggests that effective application of cognitive capacities is a crucial requirement for effective high-level organizational leadership. Thus, the formation and enhancement of these capacities and their attendant qualities should be the focus of leader development interventions. This report describes research to identify those cognitive skills and temperament factors contributing to executive performance and to identify or develop instruments to measure them. The report describes this research and provides the infrastructure required for programmatic interventions targeting the development of these capacities, together with recommendations for follow-up research to evaluate the interventions.

### Procedure:

This research is grounded in the perspective of functional leadership, in which the role of leaders is to specify and advance organizational goals and to facilitate transformation processes in the organization. Leaders often must act in variable and dynamic environmental conditions in which the nature of impediments to goal attainment is ambiguous. Thus, organizational leadership needs to be viewed as discretionary problem solving in ill-defined domains. Because problem situations often require novel approaches, their solutions also necessitate creative input.

Accordingly, a taxonomy of leadership was identified that had 13 leadership behavior dimensions (LBDs) related to discretionary and creative problem solving. The dimensions were as follows: acquiring information, organizing and evaluating information, giving feedback and maintaining control, identifying needs and requirements, planning and coordinating, communicating information, obtaining and allocating personnel resources, developing personnel resources, motivating personnel resources, utilizing and monitoring personnel resources, obtaining and allocating material resources, maintaining material resources, and utilizing and monitoring material resources.

Three validations of this taxonomy were done. The first involved a comparison of the proposed taxonomy with previously published classifications of leadership behavior. The results indicated that, of 590 dimensions from 65 systems, 89% could be assigned unambiguously to one or more of the LBDs in the present taxonomy. The second validation was a classification of 643 tasks identified in task analyses of leadership positions in three sets of organizations, including the U.S. Army. The results indicated that 86% of the tasks were assigned to 1 of the 13 LBDs. The third validation was an analysis of 26 managerial critical incidents to determine the degree to which a particular LBD was instrumental for successful performance.

Data from this effort indicate that each LBD was considered critical for performance in at least one of the managerial problem scenarios. Also, activities related to information acquisition and utilization in problem solving were judged more critical than management activities. Taken together, these three efforts provide supportive evidence for the descriptive validity of the Leader Behavior Dimension Taxonomy.

This taxonomy and the corresponding definition of high-level leadership action as creative problem solving were used to identify the knowledges, skills, abilities, and personality characteristics (KSAPs) needed by managers in leadership positions. Specifically, 65 cognitive and temperament predictors of executive ability were organized into 11 dimensions: general cognitive intelligence, creativity, crystallized cognitive skills, adaptability/ego resiliency, openness/curiosity, self-awareness, achievement, need for dominance, commitment to social systems, practical intelligence, and social intelligence.

A model was proposed that specified the interrelationships among these dimensions and with leader problem solving and performance. In this model, three exogenous variables condition embedded appraisal and implementation skills, defined as practical and social intelligence. These skills in turn determine the quality of an individual's knowledge structures. These structures subsequently define the efficacy of leader problem solving and, therefore, the level of leader performance. Further, variables in the model are determined by an individual's career experiences and by the nature of environmental moderators extant in the organizational environment. This model is considered nonrecursive, with multiple feedback loops.

Two studies to support the validity of the proposed taxonomy of leader characteristics are described. The first was a background data study on 1,834 adolescents. A variation of the rational clustering procedure was used to produce five categories of item clusters: cognitive characteristics, motivational characteristics, social skills, personality characteristics, and developmental variables. A regression analysis relating scores on these clusters to leadership scores indicated that these categories together yielded multiple Rs of .81 for males and .82 for females. Each individual cluster score contributed significantly to the prediction.

The second study was an analysis of managerial critical incidents (i.e., events critical to determination of successful performance) to establish the degree to which possession of each of the 65 proposed KSAPs would contribute to performance in a particular incident. The results of this study indicate that 58 of the 65 KSAPs were considered of relatively high importance for success in at least one problem scenario. Also, the KSAPs linked most closely or directly to creativity and to practical problem-solving skills were rated higher than other KSAPs. Taken together, these data provide evidence for the validity of the overall KSAP model developed.

### Findings:

The recommendations for leadership development that emerged from these theoretical systems vary according to a leader's level within an organization. This report describes four levels of organizational leadership. These are unit leaders, multiunit leaders, subsystem leaders, and system leaders. As leaders progress through these levels in the course of their careers, their leadership roles change. Problems increase in breadth and complexity; thus, their resolution requires well-developed and more organized knowledge structures. Also, because these problems become more variable and ill-defined at higher organizational levels, such leaders spend an increasing proportion of their time on information acquisition and problem-structuring activities and less on direct administration and subordinate development. Finally, as leaders increase the breadth of their responsibility from single or core organizational units to multiunits and then to subsystems and systems, the social dynamics of their roles and attendant forms of interaction also change. These proposed shifts in the nature of leadership roles across organizational levels suggest progressive shifts in the characteristics required for effective performance. Thus, as leaders ascend to higher role positions, the KSAPs that become more important include complex appraisal skills, metacognitive and creative capacities, self-resiliency, openness and intellectual flexibility, achievement values, commitment to the organization as a whole, and practical and social intelligence factors related to problem solving. Accordingly, the development of organizational leaders should focus on the formation and enhancement of skills that are operative at lower role positions, as well as the steady refinement and elaboration of those capacities related to success in increasingly broader role positions.

This report concludes with a review of hypotheses that are suggested by the theoretical systems outlined in the report. A corresponding measurement system for testing these hypotheses is provided. This system incorporates three types of measures: standard psychometric tests, background data or life history measures, and problem-solving tasks. The latter includes both discrete and broadly defined leadership scenarios. This measurement system also contains ratings of leadership performance and effectiveness. This system will provide a valid and sufficient test of the leader KSAP model proposed herein.

In conclusion, the leadership literature lacked a comprehensive, integrated approach for describing both the differential characteristics underlying effective organizational

leadership and the development of identifiable characteristics. This report attempts to ameliorate this situation by offering some integrated theoretical systems. It is expected that their application should facilitate an understanding of the individual factors that determine effective Army leadership at multiple levels. Further, these systems should foster principles for the systematic development of Army officers as they progress through their careers.

#### Utilization of Findings:

This report terminates phase I of a longer effort. The theoretical model and the findings derived from the validation efforts reported herein provide the foundation for phase II, which is now in progress.

# COGNITIVE AND TEMPERAMENT PREDICTORS OF EXECUTIVE ABILITY: PRINCIPLES FOR DEVELOPING LEADERSHIP CAPACITY

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# COGNITIVE AND TEMPERAMENT PREDICTORS OF EXECUTIVE ABILITY: PRINCIPLES FOR DEVELOPING LEADERSHIP CAPACITY

## Introduction

Organizations represent a powerful and persuasive force shaping the nature of our lives. Under certain conditions, the actions taken by leaders of these organizations have profound implications for both organizational operations and broader patterns of social history (Katz & Kahn, 1978; Schneider, 1987; Tushman & Anderson, 1986). Consequently, a number of research programs have sought to attain an understanding of organizational leadership in the hope of identifying developmental interventions contributing to leader effectiveness (Bass, 1985; Fiedler, 1972b, 1974a; Fleishman, 1973; Hollander, 1964; Mintzberg, 1990; Misumi, 1985; Yukl, 1989).

The broad intent of this research appears to mirror a fundamental reality of organizational life. In a series of interviews with senior Army officers, Jacobs and Jaques (1989) found that these executives perceived a need for more extensive and more effective developmental interventions. Based on these comments, it has been concluded that effective leadership development should be a high-priority function that requires a substantial investment on the part of both candidate leaders and the organization as a whole to ensure adequate long-term performance in Army leadership positions.

The Army, like many other organizations, has invested a great deal of time and energy in leadership development programs. Unfortunately, the success of these developmental interventions is often open to question. Senior Army officers, for instance, identified a number of deficiencies in the Army's leadership development programs (Jacobs & Jaques, 1989). More broadly, it has proven difficult to identify developmental interventions that lead to tangible improvements in leader performance across a variety of organizational settings (Campbell, Dunnette, Lawler, & Wieck, 1970; Fleishman, Harris, & Burt, 1955).

The present report represents an attempt to address this problem with special reference to the development of Army leaders. In essence, our central objective has been to identify cognitive skills and temperament factors contributing to executive performance and to identify or develop instruments to measure them. Accordingly, we will begin by considering certain broad issues pertinent to understanding leadership and the development of leadership capacity. Subsequently, we will outline a general theoretical system for understanding the crucial determinants of leader performance. In conjunction with current models of adult development, this substantive understanding of leader performance will then be used to specify a framework for leadership development efforts. Finally, we will describe the kind of information that needs to be obtained to test this theoretical framework for leadership development and provide the empirical infrastructure, including measures of performance-relevant characteristics at different stages of development, needed for routine implementation of this approach.

## Historical Background

Few would dispute the point that social organizations are highly complex phenomena. Organizational leadership represents an even more complex phenomenon, wherein a complex interaction between attributes of the individual and attributes of the social system acts to condition performance (Fiedler & Garcia, 1987). The complex nature of these phenomena indicates that little progress can be made in specifying optimal developmental interventions until we have a substantive understanding of the forces that shape leader performance. Thus, various leadership theories have played an important and preeminent role in the design of leadership development programs.

**Trait Theories:** Initial attempts to understand leadership were based on trait theory. Essentially, these efforts argued that certain enduring attributes of individuals made it possible for them to perform effectively in organizational leadership positions. This theory initiated a twenty-year search involving hundreds of studies examining the ability of trait measures to predict leader performance. In reviews of this research, Bird (1940), Jenkins (1947), Stogdill (1948), and Mann (1959) concluded that the bulk of the available evidence did not support this position. They found that trait measures typically yielded poor prediction ( $r = .15$ ), and that substantial variability was observed in the magnitude and direction of the relationships produced by these measures. These observations drew a shroud over the body of trait theory, one that continues to limit its application.

**Interactional Theories:** The demise of trait theory led to a search for specific behavioral dimensions that might contribute to understanding leader emergence and performance. This approach resulted in the identification of a number of behavioral styles, such as consideration and initiating structures or autocratic and democratic leadership (Bass, 1981). As Karmel (1978) points out, consideration and initiating structures appear to represent overarching constructs frequently identified in studies of leader behavior. These behavioral dimensions, while of great substantive import, were not related to leader performance in a consistent fashion across positions.

Recognition of this fact provided an impetus for a third generation of leadership theories. Typically, these interactional theories postulate that the influences of considerate and/or structuring behaviors on leader performance vary as a function of certain situational variables, such as properties of the group and leader position power. The theories of Fiedler (1978), House and Mitchell (1968), and Yukl (1971) all represent variations on this theme. Although there is reason to suspect that this interactional approach has merit (Kenrick & Funder, 1988; Magnusson, 1988), these models have not yielded strong consistent predictions of leader performance.

**Current Theories:** The apparent failure of interactional models has resulted in a broad-band search for new, alternative models for understanding leader performance. One such effort may be found in the role models proposed by Graen (1976) and Graen and Schiemann (1978). Essentially, these models stress dyadic relationships between star lieutenants and leaders, but they suffer from a failure to move beyond the dyadic framework into broader systems of roles and role relationships. Similarly, Bass (1985) and Bennis and Nanus (1985), among others, have stressed the cultural definition component of leadership in theoretical models emphasizing the need for vision and charisma. These models have done much to enhance our understanding of upper-level leadership functions. Unfortunately, however, they ignore many of the more routine leadership activities necessary for routine organizational functions and presumably the experiential development of candidate leaders.

In contrast to these complex interactional approaches, other recent theories almost seem to remove the leader from the leadership equation. For instance, leader substitutes theory (Howell, Dorfman, & Kerr, 1986; Kerr & Jermier, 1978) suggests that properties of the situation, such as subordinate skills and group cohesion, may obviate the need for leaders and, thus, their impact on organizational performance. Certainly, situational variables are of great importance in determining what leaders must do in their roles. However, the number of potential situational variables is large, and it is open to question whether situational variables are truly effective predictors of why one individual succeeds and another fails to perform well in a certain leadership role.

A related approach may be found in social cognitive models of leadership. Typically, these theories argue that leadership is ascribed to individuals based on perceptions and cognitive interpretations of their behavior (Lord, De Vader, & Alliger, 1986; Lord & Foti, 1986). Although this approach seems to ignore long-term organizational adaptation by ascribing leadership to social perceptions, thereby limiting its utility as a vehicle for leadership development, it has produced some intriguing findings. For instance, Lord and Foti (1986) found that people perceived as leaders were characterized as being intelligent and oriented toward achievement. Mumford and Connelly (in press) note that the characteristics ascribed to leaders bear substantial similarity to those ascribed to creative individuals (Wagner & Sternberg, 1985) with the exception that leaders, as opposed to creators, were held to be distinctly more concerned with social activities.

**Leader Performance:** Certainly all these approaches have contributed something to our understanding of leadership. However, they have all failed to provide clear-cut guidelines for the identification and development of organizational leaders. The reason for this failure becomes apparent when it is recognized, in keeping with role exchange theory, that leaders do, indeed, fill a certain type of boundary role position in organizations where they are required to act in such a way as to influence others in the attainment of organizational goals (Katz & Kahn, 1978; Lord, 1977). What is missing from these theories is an important notion, one which is central to the effort at hand, that although leader behavior is dictated by the needs of the situation, leaders must behave in these situations in such a way as to bring about the attainment of certain goals. Thus, leaders must perform, and leadership development becomes an issue of developing performance capacities for a certain kind of social role.

It is commonly accepted that human performance is contingent on the nature of the tasks to be performed, the conditions of task performance, and the capabilities individuals possess that allow them to perform these tasks in an efficient and timely fashion (Fleishman, 1972, 1975, 1982; McCormick, 1979). This observation may call to mind the trait theory view mentioned earlier. This human performance framework, however, differs from traditional trait theory in two senses. First, the attributes that contribute to individual performance are held to develop over time (Fleishman & Mumford, 1989a). Second, the particular attributes that contribute to performance are held to depend on the roles people possess and the problems confronting them in these roles.

Even bearing these caveats in mind, one might ask whether there is really any evidence to indicate that leader characteristics influence performance. In this regard, it should be recognized that the conclusions derived in initial reviews of the trait literature suffer from several problems. First, these reviews focused on simple, bivariate relationships. This approach is problematic, because current theories of human performance (Fleishman, 1975, 1982; Schneider, 1978) indicate that performance in complex social roles is conditioned by a number of differential characteristics in conjunction with certain properties of the situation. Second, the quality of the measures used in at least some of these studies is open to question, along with the substantive meaningfulness of the constructs under consideration (Owens, March 14, 1984, personal communication). Third, these reviews did not take into account psychometric biases, such as attenuation and range restriction, that depress the magnitude of observed validity coefficients and, in conjunction with sampling error, induce substantial cross-study variability in the magnitude of validity coefficients.

These observations might lead one to wonder whether evidence indicative of the value of trait measures has been obtained when these methodological concerns were taken into account.

In fact, studies by Ball (1933), Stamp (1988), and Terman and Oden (1959) indicate that when range restriction attributable to prior selection is taken into account, intelligence is associated with movement into sociological leadership positions. Other studies by Cornwell (1983) and Lord, Devader, and Alliger (1986) have used validity generalization procedures to control for psychometric biases. Broadly speaking, the results obtained in these studies indicate that traits, such as intelligence and dominance, evidenced far stronger relationships with indices of leader emergence and performance when corrected for attenuation and range restriction, yielding adjusted  $r$ s in the .30 to .50 range. It was found, furthermore, that sampling error could account for cross-study variability around these corrected validities.

Validity generalization procedures, however, have been subject to some telling criticisms (James, Demaree, Muliak, & Mumford, 1988). Although we cannot resolve the current controversy surrounding validity generalization herein, this debate underscores the need to attend to other sources of evidence. In one such investigation, Kenny and Zaccaro (1983) used a rotation design to assess the relative contribution of differential and situational variables to leader emergence and performance. They found that 49% to 82% of the variance in leader emergence could be attributed to characteristics of the individual. In a later investigation (Zaccaro, Foti, & Kenny, 1991), again employing a rotation design, it was found that the expression of certain traits, such as self-monitoring, could account for leader emergence on four different problem-solving tasks.

In other research, evidence has been obtained for the utility of trait constructs not considered in initial studies relating differential characteristics to leader performance. In one set of studies, Bray, Campbell, and Grant (1974) and Howard and Bray (1988) have shown that assessment of managerial characteristics derived from simulation exercises will predict career-level and performance in a longitudinal study of AT&T managers. Other work by Stamp (1988) suggests that cognitive style and information processing attributes will predict leader performance, while Carroll and Gillen (1987) and Gillen and Carroll (1985) have shown that managerial planning and information acquisition skills are related not only to leader performance but also to indices of organizational effectiveness.

Taken as a whole, the literature discussed above suggests that certain individual characteristics may have a marked impact on leader emergence and performance. The existence of these relationships, in turn, suggests that a role-based, human performance approach to understanding organizational leadership may provide a stronger foundation for systematic leadership development efforts while potentially providing a basis for integrating the diverse theoretical perspectives found in the leadership literature.

### **Developing Human Performance**

If it is granted that such an approach might provide a plausible basis for understanding the nature of effective organizational leadership, then a new question comes to fore. More specifically, is there reason to believe that this approach will contribute to the design of more effective leadership development programs? When one considers the current literature bearing on the development of human capacities, there is reason to believe that a role-based performance approach will contribute much to the design of leadership development programs.

Human performance models have long played a central role in the design of training and educational interventions (Fleishman 1982; Goldstein, 1986). Traditionally, these models have been based on the behavioral approach manifest in instructional systems design (Goldstein,

1986). Essentially, this approach involves identifying the tasks to be performed in a given role or position and the conditions under which they are to be performed. Subsequently, individuals are given structured practice on these tasks, or task components, to improve their performance capabilities and develop task-specific performance skills (Fleishman & Mumford, 1989a; Goldstein, 1986).

Certainly this task-specific strategy, by virtue of its focus on performance, offers distinct advantages with regard to performance assessment. Furthermore, it capitalizes on the domain specificity of certain knowledges and skills (Einhorn & Hogarth, 1981), thereby permitting performance to be developed in a relatively rapid and cost-effective fashion.

Recent research on the acquisition of skilled performance, however, has revealed a fundamental problem with this approach. Ackerman (1986, 1987), for instance, draws a distinction between continuous and variable mapping tasks. Continuous mapping tasks present the same information on all trials and permit the development of automatic performance. Variable mapping tasks, on the other hand, present inconsistent cues and require on-going conscious processing of information. When one examines the individual difference variables influencing performance at different stages of practice on these two kinds of tasks, it is found that characteristics reflecting broad cognitive capacities, such as intelligence and spatial visualization, continue to influence performance across the stages. On continuous mapping tasks, however, the impact of these broad cognitive abilities on performance at different stages of practice tends to diminish over time.

This finding is noteworthy because it suggests that when the conditions of task performance change from time to time or situation to situation, individuals cannot rely solely on practice. Instead, the need for controlled, adaptive responses continues to emphasize broad, general abilities. Thus, for tasks of this sort, simple behavioral training may not suffice. Some support for this proposition may be found in recent studies by Phye (1990) and Gentner and Toupin (1986) that indicate that transfer of learning to new situations requires general schema or a broad understanding of the problem situation.

The impact of broad cognitive abilities and general schema on performance in new task domains is of substantial import with regard to the development of leadership capacity. Unlike more routine jobs, leaders occupy a boundary role position (Katz & Kahn, 1978) in which they are expected to direct the activities of different subsystems. These subsystems, however, change over time. As a result, leaders are not presented with a consistent, fixed set of tasks. Rather, the tasks to be performed and the actions that must be taken vary as a function of subsystem status and organizational needs. Thus, rote behavioral training will not provide a fully sufficient basis for leadership development. Instead, such programs must focus on the development of general schema and basic characteristics that contribute to effective performance in a number of different situations.

Evidence compiled by Reif (1987), Schooler (1984), and Schmeck and Grove (1979) indicates that cognitive capacities develop slowly over substantial periods of time. Fleishman and Mumford (1989a, 1989b), moreover, have reviewed a variety of evidence indicating that certain kinds of interventions will contribute to the development and effective application of these capacities. Typically, interventions of this sort provide people with structured practice in analyzing and solving a variety of pertinent performance problems where the practice is structured to illustrate basic principles and processes while also showing their effective application to progressively more complex or difficult problems. In applying strategies of this

sort, however, it appears desirable to design interventions in such a way as to facilitate the development and application of these capacities within broad domains of tasks, problems, or activities to facilitate analogical reasoning (Medin & Ross, in press) and provide the discrete declarative knowledge required for effective application of these capacities in on-the-job training.

As a result, the behavioral and basic capacities approaches to skill development should be viewed as complementary, rather than competing, systems. In the present effort, this perspective will be used to formulate an integrated model for leadership development. Initially, organizational systems theory will be used to specify the domain of leadership tasks. Subsequently, the qualities, or knowledge, skills, abilities, and personality characteristics, that contribute to performance and performance acquisition in this task domain will be specified. These tasks and KSAPs will then be examined in relation to a series of progressive changes in leadership role demands to formulate a model for leadership development and specify the kind of measures required to test this model.

### **Organizational Leadership**

The identification of individual qualities that condition effective high-level leadership must proceed from a theoretical framework describing the nature of organizations. Such a framework would in turn specify critical functions for leader role incumbents. Although various models have been used to comprehend organizations, a consensus has emerged that organizations are best described as open systems (Katz & Kahn, 1978). Since its original proposal by Von Bernalffy (1968), socio-technical systems theory has proven useful in understanding such organizationally relevant phenomena as cycles of growth and change (Tushman & Anderson, 1986), social rigidity (Schneider, 1987), and responses to innovation (Bryan, 1980; Burns and Stalker, 1961). This theory proposes that any system is composed of integrated subsystems that, in dynamic interaction with the embedding environment, determine the current state of the system. Further, the behavior of the system as a whole is viewed as purposive, goal-oriented activity that is guided by demands and requirements from the external environment.

Accordingly, systems theory holds that organizations emerge because individuals can achieve goals through collective action that cannot be attained by working alone (Katz & Kahn, 1978). To meet these goals, organizations extract human and physical resources from the embedding environment. These raw materials are then manipulated in a transformation process derived from a division of labor, its associated role structure, and the technical or physical machinery in use. The transformed products will, hopefully, be employed/consumed by constituencies in the surrounding environment, resulting in resource acquisition, maintenance of the system and its transformation process, and system goal attainment. During this transformation process, elements of the organization will monitor outcomes, subsystem actions, and the broader environment to obtain information that serves as a basis for organizational adaptation and change. One result of these monitoring and feedback processes is that a division of labor emerges among individuals and organizational subsystems as a means of enhancing the efficiency of this transformation process. The nature and content of this division is likely to vary as a function of the transformation process and its embedding physical and social environment; further, the role of any individual or group within the organization is likely to be specified by the subgoals inherent in the nature of the transformation process.



As social systems, organizations are confronted with three fundamental problems in constructing a viable transformation process leading to continued goal attainment. First, the external environment itself is often unstable, leading to fluctuations in resources, markets, regulatory influences, and goal priorities, as well as in the feasibility and effectiveness of alternate courses of action. Second, the actions of organizational subsystems must be integrated and coordinated to ensure continued goal attainment. Third, the involvement of individuals within an organization may be conditioned by needs and goals (e.g., affiliation, esteem) that are not directly relevant to concrete production; further, the actions of organizational members may be influenced by a variety of socio-developmental, perceptual, and cognitive mechanisms. Environmental variation, subsystem differences, and human diversity will, in turn, result in substantial complexity and conflict, as well as a host of uncertain paths to continued goal attainment.

To reduce complexity and conflict, organizations will often specify legitimate and expected role requirements, ensure interchangeable roles across individuals, and formulate a hierarchical arrangement of relevant domains of responsibility. To ensure appropriate goal definition and eventual goal attainment, some individuals in the organization will have roles that require the creation and maintenance of certain subsystems, as well as the direction and coordination of subsystem actions. These individuals serve as boundary spanners, exercising influence and direction across systems and subsystems. Leadership is a property of these boundary roles, which legitimize and, in fact, demand functional interpersonal influence (Katz & Kahn, 1978).

### **Functional Leadership**

Because of the role-required focus on goal definition and attainment, organizational leadership constitutes a functional phenomenon (Lord, 1977; Hackman & Walton, 1986). Accordingly, Hackman and Walton note that

The key association in the functional approach to leadership is that the leader's main job is to do, or get done, whatever is not being adequately handled for group needs (McGrath, 1964, p. 5). If a leader manages, by whatever means, to ensure that all functions critical to both task accomplishment and group maintenance are adequately taken care of, then the leader has done his or her job well (p. 75).

The functional approach implied by open systems theory suggests a relatively straightforward definition of organizational leadership. By proposing that leadership is a property of individuals occupying functional boundary roles in the organization, this approach indicates that effective leader behavior is reflected in the overt or covert actions taken by the individual, interacting with other relevant subsystems, to influence the transformation processes occurring in these subsystems in such a way as to enhance and maintain organizational adaption through subsystem goal attainment (Mumford, 1986). Although this definition is similar to earlier conceptualizations (e.g., Bass, 1981, 1990; Fleishman, 1973), it offers a number of important implications.

First, this definition highlights the intentional, goal-oriented nature of leadership acts. Hence, leadership excludes actions not explicitly directed toward influencing the behavior of others. Leadership does reside in acts which lay a groundwork for effective interpersonal influence. Such acts are directed toward maintaining group functioning, communicating values,

providing requisite resources, goal definition, and priority setting (Fleishman & Harris, 1962; Hackman & Walton, 1986). Note that although this definition takes into account upward and lateral, as well as downward, influence, it does not require direct interpersonal contact. Thus, for example, an Army chief of staff exhibits leadership and organizational influence by formulating budgets or setting policy directions. These acts are influential on organizational members at all levels without necessitating direct interaction.

This functional organizational approach has another, perhaps more significant, implication for the definition of leader behavior. Although it is recognized that many social forces shape organizational goals and the nature of requisite influence attempts, leadership is viewed as a property of the individual. Thus, actions that are completely specified by environmental demands or normative requirements represent management or administrative functions. Alternatively, leadership requires a degree of personal discretion concerning exactly when, where, how, and why certain actions will be taken to facilitate system and subsystem goal attainment. That is, leadership requires discretion. Such discretionary actions, however, must contribute to goal accomplishment in a complex organizational environment, where some action choices will be more useful than others; effective leadership requires, then, situational diagnosis and the specification, selection, and implementation of a particular action, out of many choices, that will result in organizational goal attainment.

The organizational context can have a marked impact on the shape and form of leader's problems and their solutions. For instance, degree of discretion increases as individuals ascend the organizational hierarchy (Jacques, 1977). Thus, in upper-level positions, problem-solving identification and management demands are likely to be more intense and have greater impact than in lower-level positions, where limited discretion reflects management functions. Similarly, new organizations or organizations lacking rigid role structures, are more likely to encourage discretionary problem-solving and emphasize the need for effective leadership.

In socio-technical systems, leaders and their problem solutions are likely to focus on both people and their tasks. These solutions, however, may not have well-defined boundaries due to the interaction of complex subsystems over time. Accordingly, leaders' problem solving efforts must take into account the embedded nature of social systems, including the need to address multiple problems in an integrated fashion and the implementation of solutions in a complex, ambivalent social environment. As a result, a host of intervening events that might affect solution acceptance and implementation (e.g., member support, resource availability) require consideration; this means that a marked social perceptual element may arise in the evaluation of potential solutions and their worth to the organization (Zaccaro, Gilbert, Thor, & Mumford, in press).

This social perceptual dimension is critical for another aspect of functional leadership, the anticipation and analysis of organizational prospects and opportunities. This orientation may be perhaps the leader's most critical boundary role function in facilitating the system's proactive adaptation and sustained growth in a dynamic embedding environment. In essence, leaders are selecting "affordances" (Gibson, 1979) on behalf of the organization. This point extends Gibson's ecology model of individual action to the operations of organizational leaders. An affordance can be defined as information in the environment that provides adaptive or maladaptive value for the individual (Gibson, 1979). Baron and his colleagues have noted social affordances that reside in the relations and interactions among individuals (Baron, 1981; Baron & Boudreau, 1987; McArthur & Baron, 1983). For example, an affordance for cooperativeness "exists in the reciprocal, coordinated action of two or more individuals" (Baron & Boudreau,

1987, p. 1223). This extension of the affordance concept can also apply to higher levels of social aggregation. Thus, relationships and interactions among groups of individuals within organizations or between organizations in the embedding environment can provide affordances that cue functional possibilities for system goal attainment. This means that leaders making choices regarding particular goal paths need to attend carefully to these organizational affordances.

In sum, the functional approach to leadership indicates that leadership behavior represents a form of organizationally-based discretionary problem solving, implemented in an ill-defined and dynamic social context, where an attempt is made to bring about goal attainment by influencing the actions of other subsystems and/or attending to functional cue possibilities present in the environment. This does not mean that effective organizational leadership is the equivalent of ability test performance. Instead, leadership behavior is viewed as a complex, opportunistic, social problem-solving syndrome involving many cognitive capacities in the generation, selection, and implementation of influence attempts as well as social decision biases (Feldman & Lindell, 1989), temperamental factors (Bray, Campbell, & Grant, 1974; Fleishman, 1973), subordinate perceptions (Lord, 1977) and position resources (Fiedler & Garcia, 1987) among other variables.

### **A Taxonomy of Leader Behavior**

How does the definition of leadership as discretionary social problem solving in ill-defined domains provide any guidance as to the construction of a general taxonomic system for describing organizational leadership behavior? Because the goals and problems confronting leaders vary across organizational settings, one might expect substantial variability in leader behavior, as well as in the variables influencing the course of individual problem-solving efforts. However, the effective generation, selection, and implementation of problem solutions is conditioned by certain basic requisite activities. These core causal constructs provide the framework for a general classification of organizational leadership behavior. In the next sections we describe a taxonomy of leader behavior that includes four superordinate dimensions: information search and structuring, information use in problem solving, managing personnel resources and managing material resources. In essence, leadership influence is exerted within organizations through actions emerging from an appraisal of problem elements and implemented through discretionary management of personnel and material resources. Each of the four superordinate dimensions can be further broken down into subdimensions of related leader behaviors. The entire taxonomy is displayed in Table 1.

#### **Superordinate Dimensions**

**Information Search and Structuring:** To select and implement actions directed toward organizational functioning, leaders must first recognize the need to exert influence. This problem construction process requires that leaders obtain information about goals, goal attainment, and the nature of subsystem functions to identify social and organizational affordances, new desirable goals, or actual and potential discrepancies in goal attainment (Einhorn & Hogarth, 1981; Reitman, 1964). Furthermore, to construct a problem and generate potential solutions, it is necessary to seek out information indicative of alternative interpretations, the conditions associated with the situation, and restrictions on potential problem solutions (Kahneman, 1972; Getzels & Czikzentmihalyi, 1975; Krietler & Krietler, 1987). These processes often include the use of cognitive representations and mental models that guide attention to related problem elements. Thus, information acquisition activities are

**Table 1. Definitions of the Leadership Behavior Dimensions (LBDs)**

<b>Information Search and Structuring</b>	<b>Information Use in Problem Solving</b>
<b>Acquiring Information</b>	<b>Identifying Needs and Requirements</b>
Gathering, assimilating, storing raw information from pertinent sources.	Being alert to existing or potential problem areas or to possibilities for improving an existing system, method, or status; identifying significant factors or constraints that influence the nature of a problem or the requirements for problem solution.
<b>Organizing and Evaluating Information</b>	<b>Planning and Coordinating</b>
Categorizing and converting raw information into useful knowledge or awareness by carefully considering sources, timeliness, accuracy, relevance, and overall usefulness in respect to relevant goals and organizing structures.	Conceiving ways and means to accomplish jobs, goals, and missions with available resources and to solve problems with respect to identifying needs and requirements; consulting with others in order to apprise them of plans and activities and to become knowledgeable as to what they are doing or planning to do; confirming what assistance others can and will provide.
<b>Feedback and Control</b>	<b>Communicating Information</b>
Following up on guidance, directives, and actions to learn whether they are understood and implemented at all levels; determining whether the end results of your guidance, directives, and actions were that was expected and desired.	Transmitting, exchanging, reporting, or passing on information in the form of words, messages, emotions, ideas, or signals by any means such as speaking, writing, facial expression, gestures, automatic data processing, or any combination of these either to individuals or groups.

**Table 1. Definitions of the Leadership Behavior Dimensions (LBDs) (Continued)**

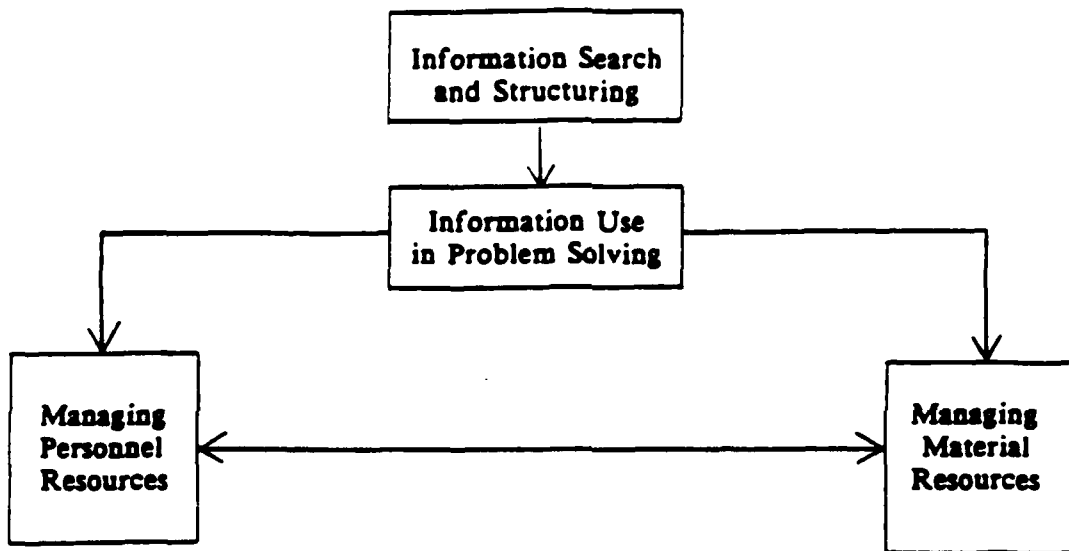
<b>Managing Personnel Resources</b>	
<b>Obtaining and Allocating Personnel Resources</b>	<b>Managing Material Resources</b>
Requisitioning, processing, classifying, and assigning personnel in accordance with authorizations, qualifications, and needs.	Obtaining and Allocating Material Resources
	Requisitioning and issuing supplies and equipment; requesting and providing facilities and support; requesting and disbursing funds.
<b>Developing Personnel Resources</b>	<b>Maintaining Material Resources</b>
Setting standards; fostering promotions, schooling, and professional development for the deserving; teaching individuals things they need to know in order to accomplish assigned tasks or increase their potential value to the organization.	Storing, safeguarding, servicing, or repairing supplies and equipment; repairing facilities and vehicles; safeguarding funds and documents.
<b>Motivating Personnel Resources</b>	<b>Utilizing and Monitoring Material Resources</b>
Initiating actions to reward and recognize performance; providing a climate and social conditions capable of facilitating performance; insuring that the needs and values of individuals can be met; exhibiting an interest in and providing support for individuals and their efforts.	Prescribing how supplies, equipment, facilities, transportation, and funds will be used; preparing and maintaining reports, charts, receipts, logs, files, journals, calendars, checklists, and automatic data records as a means of monitoring the status of supplies, equipment, facilities, transportation, funds, and documents.
<b>Utilizing and Monitoring Personnel Resources</b>	
Dividing workloads; assigning responsibilities; observing performances, preparing and maintaining reports, charts, logs, files, journals, calendars, records, and checklists as a means of monitoring morale, welfare, performance, and training.	

likely to provide a crucial basis for effective organizational leadership. Information gained through these activities, however, does not provide a fully sufficient basis for solution generation (Medin & Ross, in press; Snow & Lohman, 1984). Rather, this information must be organized and interpreted using available, or perhaps created, categorical knowledge structures, cognitive representations, or schemata that provide a basis for memory, judgement, and inference (Barasalou, 1983; Cantor & Mischel, 1979; Chi, Glaser, & Rees, 1982; Fiske & Taylor, 1984; Siegler & Richards, 1982). While these categorical structures may induce some bias in leaders' thoughts on a problem, especially among novices, they appear to provide an effective system for information storage and application (Feldman & Lindell, 1988; Siegler & Richards, 1982).

**Information Use in Problem Solving:** Simply having structured information about a problem does not imply the generation of an effective problem solution contributing to organizational effectiveness. The results of a variety of studies suggest that application of certain general processing strategies or metacognitive rule systems to extant knowledge structures leads to a planned and organized set of selected activities believed to bring about attainment of goals (Medin & Ross, in press; Gick & Holyoak, 1983; Hayes & Flower, 1986; Halff, Holan, & Hutchins, 1986; Krietler & Krietler, 1987; Sternberg, 1986). Specific goal-related demands and adaptive requirements in the organizational context guide a leader's selection and utilization of particular knowledge categories. This results in the development of action plans and the specifications for their implementation.

**Discretionary Management of Personnel and Material Resources:** The remaining superordinate dimensions, managing personnel resources and managing material resources, concern the actual implementation of developed plans and strategies. Within organizational settings, there are two basic kinds of actions leaders might take to influence socio-technical system functioning. The first is acting on the people doing the work to change their behavior through mechanisms such as goal definition, the clarification of preferred paths or strategies of goal attainment, and necessary training of organizational personnel (House & Mitchell, 1968). The second kind of action is the manipulation of the physical or material resources being employed within a subsystem (Shorris, 1984; e.g., establishing budget priorities or obtaining new equipment). If it is granted that individuals will differ in their propensity to apply these alternative influence mechanisms, then the earlier work of Fleishman (1973), Fiedler (1957), Likert (1961), and Fine (1974) has underscored the impact of these actions on leader effectiveness. It should be recognized, though, that in many instances of effective leadership both kinds of influence actions are likely to occur in an integrated fashion, allowing both the social and technical aspects of the organization's production processes to be taken into account. Also, as we have noted, leadership influence does not include the rote implementation of personnel and resource management decisions. Instead, it involves discretionary actions and decision-making regarding the structuring and utilization of these resources.

Recognizing that appropriate actions on people or material resources depend on the organization's goals, its environment, and the conditions of the product transformation process, it becomes apparent that information acquisition and structuring provides a basis for problem solution generation and the specification of viable influence strategies. Figure 1 presents a schematic overview of the four superordinate dimensions' roles in an integrated sequence of leader action. These interrelationships imply some interdependencies among categories of leader behaviors and, in accordance with a functional approach, suggest that leader behavior represents an integrated, albeit complex, performance oriented toward organizational adaptation. Failure to perform satisfactorily on any one of these dimensions will, moreover, result in a weak or misguided influence attempt. The existence of multiple hurdles suggests one



**Figure 1. Interrelationships Among the Superordinate Dimensions**

reason why it is difficult to lead effectively or develop leadership capacity: To wit, a leader incapable of generating a viable plan will be ineffective, even when information is available. Finally these interdependencies specify mediation and therefore explain why information acquisition may not bear a strong direct relationship to overt management action in observational research.

### **Leader Behavior Dimensions**

Because of the need for precision in the description of leader behavior, it seems worthwhile to break down the complex nature of the superordinate dimensions into a more discrete set of summary dimensions. Such a hierarchical classification provides a viable mechanism for compromising simultaneous demands on such systems for breadth and descriptive accuracy (Fleishman & Quaintance, 1984; Gustafson, 1984). We have chosen to refer to the lower-order dimensions as Leader Behavior Dimensions (LBDs).

**Information Search and Structuring Subdimensions:** The information search and structuring superordinate category includes three lower-order LBDs. Two of these dimensions, labeled Information Acquisition and Feedback and Control, respectively, represent mechanisms for acquiring information. The specification of the Information Acquisition LBD derives from the necessity to obtain information concerning subsystem action and goal attainment not directly relevant to past problem solutions. By providing a basis for problem definition, information acquisition activities are likely to represent a fundamental form of leader behavior in organizational settings. The Feedback and Control dimension derives from prior work indicating that monitoring of problem solution implementation to identify extant problems and necessary adjustments in action sequences represents a crucial determinant of effective real-world problem solving (Brown and Campione, 1986; Einhorn & Hogarth, 1981). Such monitoring activities may, in fact represent a crucial determinant of leader performance, since action plans calling for ongoing adjustment are often required in complex organizational systems where unintended consequences often emerge, and feedback is typically both ambiguous and extended over time (Jacques, 1977).

A third LBD subsumed under this general rubric is Organizing and Evaluating Information. Essentially, this category represents a problem construction dimension where acquired information is screened, organized, and evaluated with respect to organizational and subsystem goals. Often, such processes include the formation and utilization of cognitive representations or mental models that encode elements of organizational problems, potential solutions, and opportunities for organizational advancement (Giola & Poole, 1984; Zaccaro, Gilbert, Thor, & Mumford, in press). Several studies indicate that these processes represent a discrete set of activities having a marked impact on complex problem-solving endeavors by shaping the perceived nature of the problem (Dillion, 1982; Getzels & Czikzentmihalyi, 1975; Similansky, 1984; Sternberg, 1986; 1988). However, because application of expertise in organizing and evaluating information is often distorted by stereotypical categorical structures (Feldman & Lindell, 1988) and because the efficacy of such activities may also be influenced by such variables as time pressures and stress (Getzels & Czikzentmihalyi, 1975; Fiedler & Garcia, 1987), these activities cannot be viewed as a simple cybernetic process. Not only is this observation reinforced by the role of personal and organizational values in goal definition and discrepancy evaluation, but also by the fact that problem construction may involve redefinition of goals in transformational acts, as well as the need to maintain effective operations under conditions of environmental change.



**Information Use in Problem-Solving Subdimensions:** After information has been obtained and a problem identified and diagnosed, leaders must formulate a solution and/or course of action. To do so, leaders will activate pertinent information structures and manipulate them using basic processing rules to identify additional information requirements, potential constraints on problem solutions, viable courses of action, and the potential payoffs associated with these actions (Einhorn & Hogarth, 1981; Hayes & Flower, 1986; Medin & Ross, in press; Sternberg, 1986; 1988). These potential action sequences and their anticipated outcomes will then be evaluated to arrive at a potential problem solution (Hogarth, 1986). Thus, the activities subsumed under this dimension represent actual cognitive problem solving. We refer to this dimension as Identifying Needs and Requirements precisely because it reflects the generation of ideas for problem solution rather than their actual implementation.

The next dimension reflects activities associated with the implementation of selected problem solutions, which we refer to as Planning and Coordinating. Such activities entail the detailed specification of the nature and timing of influence activities within an organizational context. Planning and coordination become particularly important when (a) problem solutions are novel, (b) support from multiple subsystems is required in the influence attempt, and (c) ongoing subsystem operations are complicated, involving multiple interdependencies. Additionally, these activities are likely to become more salient when the subsystems involved in solution implementation display poor cohesion or morale, distrust, or destructive intergroup competition.

The third information use LBD likely to have a marked impact on leader performance is Communicating Information. One role of communication is, of course, coordination with other organizational units and persuasion intended to obtain support for influence efforts. Communication may also be required in solution generation, especially when information must be obtained from subordinates or supervisors (Vroom, 1976). More certainly, however, influence can not be exerted unless it is perceived and acted upon by the members of the targeted subsystems. Thus, it is not surprising that definitions of leadership proposed by Fleishman (1973) and Simonton (1988) emphasize the importance of such activities.

**Discretionary Management of Personnel Resources Subdimensions:** When leader problem solving requires action on organizational personnel to enhance or maintain the transformation process, there appear to be four basic avenues for action. One avenue, underscored by both Fleishman (1973) and House and Mitchell (1968) is Motivating Personnel Resources. This dimension includes actions directed toward increasing unit cohesion, building individual commitment, managing interpersonal conflict, or demonstrating concern and confidence in people. A second avenue of personnel management has been illustrated in recent discussions of the leader as a role model or mentor (House & Mitchell, 1988; Manz & Sims, 1989; Tushman & Anderson, 1986). This LBD, called Developing Personnel Resources, refers to such leader actions as modeling, coaching, training, and providing feedback, which serve to enhance the performance capabilities of subordinates with respect to continued goal attainment.

Another way leaders may enhance or maintain subsystem performance is by Obtaining and Allocating Personnel Resources. Although influence attempts of this sort have received less attention in the leadership literature than motivational and developmental interventions, Graen (1976) illustrates their importance in his studies of the relationship between leader performance and subordinate differentiation. This LBD subsumes any activity which attempts to enhance group functions by identifying individuals who can effectively fill requisite technical or social roles in the subsystem and allocating these individuals to tasks.

The final LBD for managing and influencing personnel has been labeled Utilization and Monitoring of Personnel Resources. This dimension subsumes supervisory, policy-setting, and control activities that channel interpersonal behavior and subordinate task-related actions along lines contributing to group or subsystem performance. These activities may include such mechanisms as scheduling, performance monitoring, and establishing safety regulations.

**Discretionary Management of Material Resources Subdimensions:** Although the leadership literature has traditionally focused on interpersonal influence strategies, in socio-technical systems one can also affect subsystem performance by changing the technical work process. The first LBD subsumed under this rubric is Obtaining and Allocating Material Resources. The behaviors captured by this dimension include activities such as budgeting, financing, and acquiring new technologies for people to perform requisite tasks (House & Mitchell, 1981; Tornow & Pinto, 1976).

A second LBD relevant to materially-oriented influence attempts is the Maintenance of Material Resources. This dimension captures behaviors concerned with preservation and maintenance of the materials, machines, and supplies that provide a basis for production. The final LBD in this category is Utilizing and Monitoring Material Resources. This dimension reflects the influence on goal attainment of policies leaders establish to utilize and monitor the subsystem's technical infrastructure.

### **Dimensional Organization**

The proposed LBDs are not intended to reflect completely independent and unrelated subdomains of leader behavior. Figure 2 presents the hypothesized relationships among the LBDs as an organized act of leader problem solving. Four points are relevant to the construction of this model. First, the nature of the hypothesized relationships among LBDs follows from the content of each dimension and from the model in Figure 1. Second, communication serves in both a mediational and moderator role underscoring the general significance of such activities and the fact that consideration behaviors building expertise and trust lay a groundwork for many interpersonal influence attempts (Fleishman, 1973). Third, effective influence attempts are likely to be contingent on a variety of earlier, up-front activities such as information ordering and planning and coordination. Unless sufficient attention is given to these activities, it is unlikely that leadership influence can be wielded effectively. Finally, in addressing many broad, significant problems, these general activities are likely to occur in a dynamic, progressive sequence involving multiple, overlapping goal and team-oriented collaboration (Fleishman & Zaccaro, in press).

The impact of the activities subsumed under any given LBD will vary with the nature of the problems posed by system operation. As a result, the significance of these LBDs is likely to vary with organizational type and position demands. Thus, higher level executives may spend substantially more time in organizing and evaluating information or identifying needs and requirements (Pelz, 1952), while middle managers may devote more time to communication, planning, and coordination (Pelz, 1952; Shorris, 1984). Furthermore, specific behavioral illustrations of each LBD will necessarily vary with the particular problem at hand. Thus, this taxonomy, while arguing for some generalities in the leadership process, does not imply uniform leader behavior or suggest that only one set of leader characteristics will act to condition performance. Instead, one is more likely to find a common behavior set reflected in the LBDs; what is also likely is a complex syndrome of leader characteristics that are oriented around core attributes required for effective organizational influence.

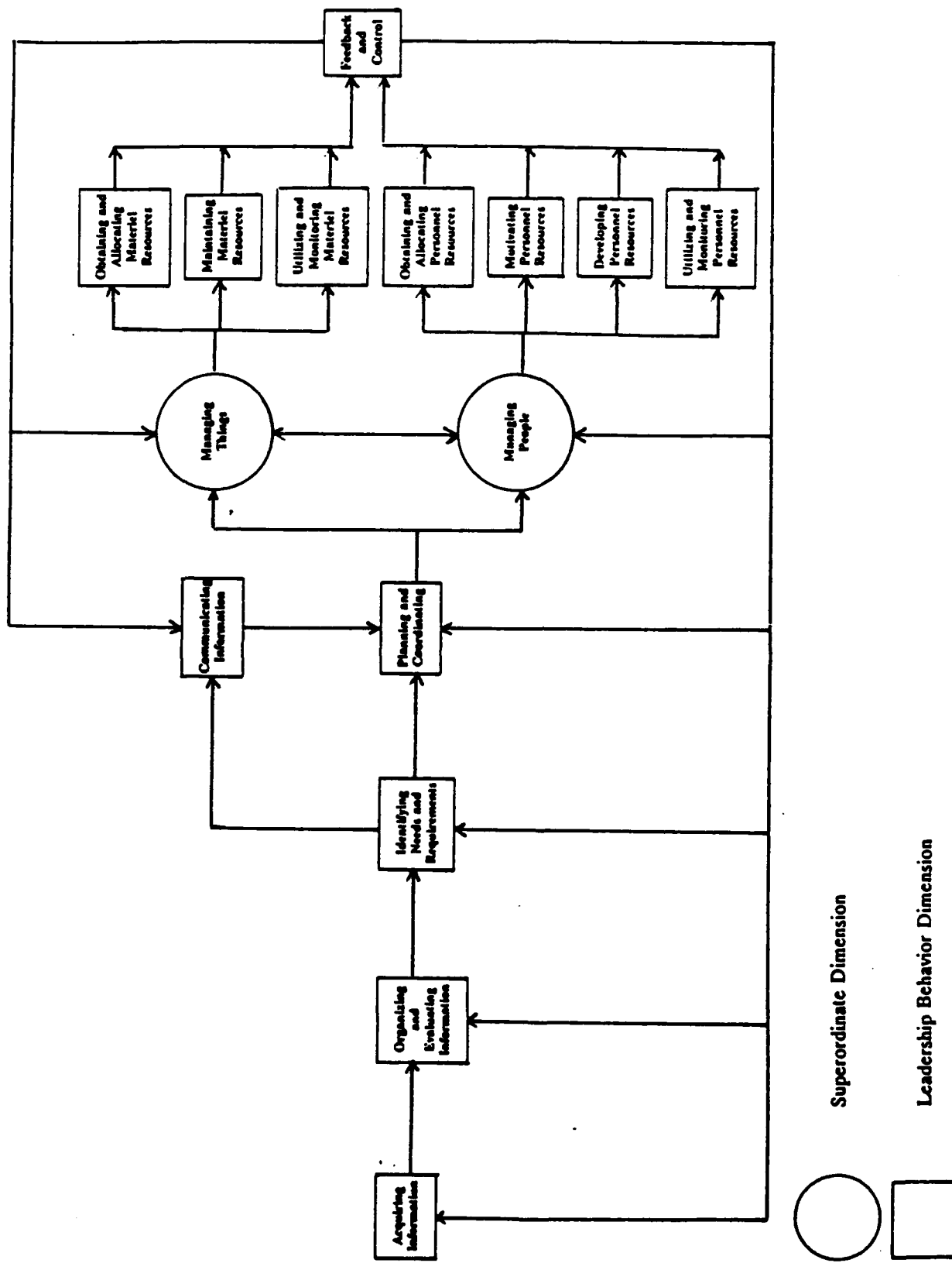


Figure 2. Interrelationships Among the Leadership Behavior Dimensions

## Validation of Leadership Taxonomy

The utilization of a taxonomic system requires first a validation of its meaningfulness. Thus, regarding the leader behavior taxonomy, it is necessary to verify (a) the degree to which the system includes all leadership behaviors relevant to discretionary problem-solving, (b) the degree to which subdimensions within the taxonomy are mutually exclusive, and (c) the reliability of the system as a whole (Fleishman & Quaintance, 1984). In this section we describe three validation efforts, one conducted prior to this research effort (Fleishman, Mumford, Zaccaro, Levin, & Hein, in press), and two completed as part of this project. The first validation involves a comparison of the present taxonomy with previously published classifications of leadership behavior. The second validation effort is a categorization of leadership tasks uncovered in job analyses conducted in three organizations. The third effort is an analysis of managerial critical incidents to assess key determining behaviors.

**Comparative Evidence:** Fleishman and Quaintance (1984) note that one useful source of validation evidence may be found in the overlap between a proposed taxonomic system and alternate descriptive systems formulated using different samples and methods for different purposes. Accordingly, a study was completed assessing the ability of the LBDs to account for dimensions proposed by 65 systems for classifying leadership behaviors. A summary of these systems is presented in Appendix A (see Fleishman et al., in press, for additional details).

Dimensions proposed in earlier systems concerned with technical competence, personal characteristics, general problem solving, and general decision making were eliminated, due to inconsistency with the definition of leader behavior in use. The contents of the remaining dimensions were then reviewed with respect to the definitions of the LBDs in the proposed taxonomy; a given dimension was assigned to one or more of the LBDs only if it reflected similar behavioral content. After these content assignments were completed, they were analyzed to determine (a) the number of dimensions found in the literature that could be assigned to each LBD, and (b) the number of classification schemes proposing one or more dimensions similar to each LBD.

The results of these analyses are presented in Table 2. Of the 590 dimensions examined in this effort, 89% could be assigned unambiguously to one or more of the LBDs. As might be expected given the number of LBDs, each one accounted for a relatively small percentage of the dimensions found in the literature. However, of greater import was our finding that the median number of analogous dimensions identified was 29, indicating that most of the LBDs find substantial justification in the extant literature. Some additional support for this conclusion was provided by the finding that, with two exceptions, each LBD had analogs in at least 32% of the existing classification schemes; LBDs that were concerned with overt social behavior had analogs in more than 60% of the schemes. The two exceptions were the LBDs labeled organizing and evaluating information and maintaining material resources, perhaps because they involved little or no overt social interaction. Taken together, though, the relatively high congruence between the LBDs and earlier attempts to describe leadership behavior is indicative of the meaningfulness of our proposed classification scheme.

**Leader Task Analysis:** This study was conducted to examine more directly the meaningfulness of the proposed classification system. Lists of leadership tasks were developed from task analyses completed in three sets of organizations. One list was taken from Wallis, Mumford, and Korotkin's (1985) descriptions of the tasks performed by commissioned and noncommissioned Army officers. This list contained 163 tasks. The second list came from a

**Table 2. Overlap Between Leadership Behavior Dimensions and General Literature**

	#D <sup>a</sup>	#C <sup>b</sup>	%D <sup>c</sup>	%C <sup>d</sup>	Content <sup>e</sup>
<b>Information Search and Structuring</b>					
Acquiring Information	28	21	5	32	9H, 17C, 19D, 21B, 23A, 23B, 24B, 27Ba, 28D, 32M, 33C, 33D, 35E, 36A, 37E, 41A, 41K, 41L, 41M, 46A, 48E, 57G, 58A, 59G, 60L, 60M, 65J
Organizing and Evaluating Information	12	10	2	15	15D, 27Bb, 27Bc, 36A, 41B, 41C, 43J, 44A, 48E, 57G, 60K, 64Aa
Feedback and Control	60	39	10	60	1B, 2C, 6B, 6C, 7B, 7D, 9H, 10B, 14B, 16D, 17C, 18B, 18C, 21F, 23E, 23F, 24D, 27I, 27E, 32F, 32I, 32J, 38C, 39D, 39F, 40A, 40B, 40D, 41H, 41I, 41J, 43C, 43I, 43L, 45B, 45F, 47D, 47Q, 49B, 51C, 52D, 52G, 52H, 54Bd, 56D, 56E, 57C, 57E, 58, 59H, 60F, 60G, 60P, 60T, 61D, 62B, 63A, 64D, 65D, 65U
<b>Information Use in Problem Solving</b>					
Identifying Needs and Requirements	32	29	5	44	2A, 6B, 8C, 10B, 14B, 15A, 19A, 20A, 22B, 23D, 25B, 27Bb, 28C, 32C, 32D, 33G, 33H, 35C, 37A, 44A, 48D, 48F, 50A, 51A, 53B, 53E, 57G, 59F, 61C, 62A, 64Ab, 65G
Planning and Coordinating	63	37	11	56	1A, 1C, 3A, 3B, 5H, 6A, 6C, 9A, 9B, 9D, 10B, 11D, 13Fa, 13Fb, 13Fc, 15B, 17A, 18F, 19C, 21E, 22B, 24A, 24C, 27Ga, 27Gc, 27Gd, 27Ge, 28B, 39E, 30A, 35D, 36A, 41E, 41F, 41G, 43A, 43B, 45A, 45B, 47I, 47J, 48C, 52A, 52E, 54Ad, 54Bb, 56A, 57B, 59E, 60B, 60D, 61B, 61F, 62A, 63C, 64Ba, 65G, 65O, 65P
Communicating Information	43	31	7	48	5I, 5J, 7E, 10B, 11A, 12C, 13Ca, 13Cb, 14B, 21B, 23G, 23H, 25A, 27C, 32C, 32F, 33E, 33F, 36A, 39A, 41D, 43F, 43H, 44C, 44E, 46B, 46I, 51B, 54Ba, 55G, 57F, 58B, 58C, 59G, 59I, 60C, 61E, 62A, 63C, 63D, 63E, 65D, 65K
<b>Managing Personnel Resources</b>					
Obtaining and Allocating Personnel	59	43	10	66	1B, 2B, 2D, 5D, 6B, 7A, 8D, 10B, 11C, 12D, 14B, 16B, 18H, 18I, 19B, 20A, 21D, 23J, 24F, 26G, 26H, 27Aa, 27Ab, 27Fa, 27Fb, 27Fc, 31A, 31B, 32G, 33I, 33J, 36A, 37C, 38B, 39F, 40E, 40F, 43C, 43L, 44B, 45B, 47A, 47B, 52B, 52C, 52J, 53C, 55J, 56B, 56C, 57D, 59A, 61A, 62A, 63C, 64Bb, 65F, 65H, 65K

**Table 2. Overlap Between Leadership Behavior Dimensions and General Literature  
(Continued)**

	#D <sup>a</sup>	#C <sup>b</sup>	%D <sup>c</sup>	%C <sup>d</sup>	Content <sup>e</sup>
<b>Managing Personnel Resources (Continued)</b>					
Developing Personnel Resources	32	24	5	36	7C, 10A, 12A, 14A, 17B, 25H, 26B, 27D, 30B, 32B, 32D, 32E, 32O, 36B, 36C, 36D, 37B, 39F, 43L, 45B, 47R, 48B, 49C, 51E, 55H, 59D, 62B, 65C, 65E, 65O, 65R
Motivating Personnel Resources	97	44	17	68	3F, 3G, 3H, 5B, 6B, 6D, 6E, 6F, 8B, 9D, 9E, 10A, 11B, 11E, 14A, 16C, 16D, 16E, 16F, 16G, 17E, 17F, 17G, 17H, 18E, 18J, 21C, 23K, 23L, 23M, 23N, 23O, 24F, 24G, 24H, 27Ea, 27Eb, 27Ec, 27Ed, 30C, 30E, 31C, 32A, 32H, 32I, 32N, 33A, 33B, 35A, 35B, 35G, 35H, 36B, 36C, 36D, 37F, 38C, 39B, 39C, 39F, 43C, 43L, 45B, 47B, 47C, 47G, 47H, 48A, 49D, 50C, 52F, 52I, 53H, 54Ca, 54Cb, 54Cc, 55D, 55E, 55F, 57C, 59B, 60J, 60O, 60S, 62B, 64Da, 64Db, 64Ea, 65A, 65B, 65E, 65L, 65N, 65P, 65Q
Utilizing and Monitoring Personnel Resources	50	34	8	52	1B, 5D, 5G, 2C, 6B, 8A, 11C, 12B, 13Bc, 13Bd, 14C, 14D, 16B, 17D, 18B, 20B, 20C, 21A, 21F, 22A, 24D, 24E, 26A, 26F, 30D, 32J, 37B, 39D, 39F, 43I, 43L, 45B, 45C, 47R, 49C, 51D, 51E, 52H, 53F, 53G, 54Bc, 55I, 55K, 59C, 60E, 60Q, 63B, 65C, 65G, 65Q
<b>Managing Material Resources</b>					
Obtaining and Allocating Material Resources	30	25	5	38	2B, 10B, 14B, 16A, 18D, 18H, 19B, 26C, 31A, 31C, 32G, 33I, 34J, 36A, 37D, 39G, 40F, 43D, 43E, 44B, 47D, 49A, 50B, 50E, 53C, 53D, 61A, 62A, 64Db, 65H
Maintaining Material Resources	13	13	2	21	9G, 10B, 14B, 18D, 18J, 26D, 27D, 33A, 36A, 39F, 45B, 45E, 62A
Utilizing and Monitoring Material Resources	28	20	5	32	2C, 10B, 14B, 18D, 21F, 24B, 24E, 26A, 26E, 28E, 30D, 32J, 36A, 37B, 39D, 39F, 41H, 43G, 43I, 43K, 45A, 45B, 45C, 45D, 47D, 47O, 58F, 62A

NOTE<sup>a</sup>: Number of similar dimensions proposed in the literature.

NOTE<sup>b</sup>: Number of classification systems proposing similar dimensions.

NOTE<sup>c</sup>: Percent of dimensions in the literature similar to the proposed leadership behavior dimensions.

NOTE<sup>d</sup>: Percent of classification systems in the literature containing dimensions similar to the proposed leadership behavior dimensions.

NOTE<sup>e</sup>: Dimensions in Table 1 assigned to the proposed leadership behavior dimensions.

task analysis completed with managers from a telecommunications firm. This list contained 236 items. The third list was a task inventory administered by Fleishman & Friedman (1988) to 200 research and development managers from 10 corporations. This inventory contained 244 tasks. The three task lists are presented in Appendix B.

Two psychologists and three psychology graduate students, all of whom were familiar with the content and nature of the LBDs, were presented with each leadership task and asked to assign it to one of the LBDs. All assignees worked independently. The task assignments were then analyzed to determine (a) the percentage of tasks that were assigned by three or more assignees to any dimension in the classification scheme, and (b) the percentage of tasks assigned by three or more raters to each of the particular LBDs. The results of these analyses, shown in Table 3, indicate three important findings. First, 86% of the 643 tasks were assigned by three or more raters to one of the 13 LBDs. Only 91 of the 643 tasks could not be assigned unambiguously to one of the dimensions. This finding indicates that the proposed classification scheme provides a robust and content valid description of leadership behavior across three different types of organizations. The second finding of note was that the largest percentage of task assignments across the three lists (57%) was made to the superordinate dimension, information use in problem solving. One subdimension, planning and coordinating, accounted for 19% of the tasks across the three sets of managers. This supports the significance we have noted of problem solving activities as an integral part of leadership. We do note, however, that the second largest percentage of task assignments to a superordinate dimension (22%) were made to the LBDs associated with the management of personnel, behaviors more widely emphasized in prior descriptions of leadership behavior. Also, the relative percentages were not identical across all three types of organizations. The majority of tasks performed by Army officers were more evenly split between information use in problem solving (27%) and personnel management (31%). Taken together, though, this analysis both supports our view of organizational leadership and provides a degree of congruence with other definitions.

The third significant finding is that 11% of the tasks were assigned to the three subdimensions grouped under the superordinate dimension of Managing Material Resources. Indeed, for Army officers, this task figure rose to 16%. While the percentage of task assignments to this category was lower than to each of the other three superordinate dimensions, it still represents a significant proportion of time spent by organizational leaders. However, these activities are missing from most descriptions of leadership and are rarely the focus of leadership development interventions. Our findings suggest that activities related to material management deserve a more prominent role in theoretical and empirical representations of organizational leadership.

**Evidence from Managerial Critical Incidents:** As another validation study of the taxonomy, a series of managerial critical incidents were rated according to the degree to which the LBDs contributed to the problem solutions represented in these incidents. Twenty-six incidents were selected from a review of management case studies and problem scenarios. Scenarios were chosen to produce diversity in problem settings, situational characteristics, and in the general nature of desired solutions. They also reflected primarily problems typically confronted by mid to upper level managers. Each of the incidents was then evaluated by four judges according to how much each LBD was instrumental for successful performance by the manager (1 = very little; 5 = very much). Table 4 summarizes the results of these ratings. Column 1 indicates the leader behavior dimensions. Column 2 contains the mean ratings for each LBD across raters and across incidents. Column 3 contains the standard deviations of the mean ratings across tasks. Columns 4 and 5 contain respectively the range of means for the 26

**Table 3. Leadership Tasks Categorized by Leader Behavior Dimensions**

	Telecommunications		R&D		Army		Total	
	N	%	N	%	N	%	N	%
<b>A. Information Search and Structuring</b>	44	20	36	15	17	10	100	15
1. Acquiring Information	17	7	6	2	3	2	26	4
2. Organizing and Evaluating Information	19	8	21	9	12	7	52	8
3. Feedback and Control	11	5	9	4	2	1	22	3
<b>B. Information Use in Problem Solving</b>	93	39	99	40	44	27	236	37
4. Identifying Needs and Requirements	8	3	5	2	3	2	16	2
5. Planning and Coordinating	39	17	49	20	34	21	122	19
6. Communicating Information	46	19	45	18	7	4	98	15
<b>C. Managing Personnel Resources</b>	33	14	61	25	50	31	144	22
7. Obtaining and Allocating Personnel Resources	1	1	12	5	7	4	20	3
8. Developing Personnel Resources	9	4	18	7	23	14	50	8
9. Motivating Personnel Resources	3	1	7	3	14	9	24	4
10. Utilizing and Monitoring Personnel Resources	20	8	24	10	6	4	50	8
<b>D. Managing Material Resources</b>	22	9	23	9	27	16	72	11
11. Obtaining and Allocating Material Resources	12	5	15	6	7	4	34	5
12. Maintaining Material Resources	2	1	2	1	14	8	18	3
13. Utilizing and Monitoring Material Resources	8	3	6	2	6	4	20	3
Unassigned	41	17	25	10	25	15	91	14
<b>TOTAL</b>		236		244		163		643



**Table 4. Analysis of Managerial Critical Incidents: LBDs**

Dimensions	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>A. Information Search and Structuring</b>				
1. Acquiring Information	3.2691	.565	2.5000-4.5000	.5000-1.2910
2. Organizing and Evaluating Information	3.6346	.369	3.0000-4.2500	.5000-1.6330
3. Feedback and Control	3.0481	.566	2.2500-4.2500	.5000-1.7078
<b>B. Information Use in Problem Solving</b>				
4. Identifying Needs and Requirements	3.9904	.403	3.2500-4.7500	.0000-1.0000
5. Planning and Coordinating	3.6250	.506	2.5000-4.2500	.5000-1.7078
6. Communicating Information	2.9712	.653	1.7500-4.5000	.5000-1.5000
<b>C. Managing Personnel Resources</b>				
7. Obtaining and Allocating Personnel Resources	2.4712	.931	1.2500-4.7500	.5000-1.7321
8. Developing Personnel Resources	2.1538	.825	1.0000-3.7500	.0000-1.7321
9. Motivating Personnel Resources	2.3846	.947	1.2500-4.2500	.5000-1.8930
10. Utilizing and Monitoring Personnel Resources	2.9038	.834	1.5000-4.7500	.5000-1.5000
<b>D. Managing Material Resources</b>				
11. Obtaining and Allocating Material Resources	2.7596	.730	1.5000-3.7500	.0000-1.8257
12. Maintaining Material Resources	2.0192	.703	1.0000-3.5000	.0000-1.4142
13. Utilizing and Monitoring Material Resources	2.7019	.951	1.0000-4.2500	.0000-1.2910

incidents across four raters and the range of standard deviations for the 26 incidents, the latter indicating the degree of interrater agreement.

The analysis of these ratings indicates several important points. First, given the diversity of problem scenarios, as a set the LBDs were perceived as generally contributing to successful performance. Means ranged from a low of 2.02 (for Maintaining Material Resources) to 3.99 (Identifying Needs and Requirements). Further, the data on range of means for each LBD indicates that each one was considered as being critical for performance in at least one of the managerial problem scenarios. Second, activities related to information acquisition and utilization in problem-solving were judged as more critical than management activities (mean ratings across activities were 3.42 and 2.48, respectively). Across the incidents, identifying needs and requirements was viewed as the most important of the information activities. Indeed, the lowest mean rating for any incident on four of these six behavior patterns was at or above 2.5 (as indicated by the range of means). This supports the centrality of these activities suggested by a functional definition of leadership and in the proposed dimensional organization of the taxonomy (see Figure 2). Thus, successful leadership performance is closely related to the implementation of effective information activities, which indeed appear to precede in importance the leader's management and coordination of organizational resources. A third observation is that activities related to material management, while lower compared to information activities, were seen as contributing to performance in some of the problem scenarios. This observation corresponds to the findings from ratings of leadership tasks reported in Table 3. Indeed, in the critical incidents, mean ratings of all activities in this dimension (2.49) were comparable to the mean ratings given to the activities aggregated under the managing personnel dimension (2.48). However, while many theories of leadership effectiveness stress personnel management, few describe the importance of material management.

These data provide additional support for the efficacy of the proposed taxonomy of leadership and its dimensional organization. Also, it supports the central role ascribed to information management and planning activities. However, no one activity was judged to be critical to performance in all activities; given the diversity in problem scenarios, this is to be expected. The behaviors required in one situation are likely to be very different from actions required in others (Zaccaro, Foti, & Kenny, 1991; Zaccaro, Gilbert, Thor, & Mumford, in press). Nonetheless, the data from these analyses highlight the importance, across multiple leader problem solving incidents, of the behavior dimensions in the leadership taxonomy. Accordingly, the identification of differential or personal characteristics that promote leader effectiveness should proceed from these dimensions.

### **A Categorical Process Model of Leader Characteristics**

We turn now to the specification of individual characteristics that are linked to effective organizational leadership. As a prelude to this effort, we have presented a framework, based on open systems theory, for describing the organizational role of leadership, and we have offered a corresponding taxonomy of leader behavior dimensions. The basic elements of this theoretical system include the utilization of higher order cognitive processes in the service of organizational and subsystem goal attainment. Further, because leadership is inherently embedded within a social context, it necessitates such social processes as the perception of social and organizational affordances, the development and motivation of subordinate capabilities, negotiation, subsystem maintenance, and the resolution of conflicting needs and demands among subordinates. Given their criticality, these particular elements should guide the selection of leader characteristics to

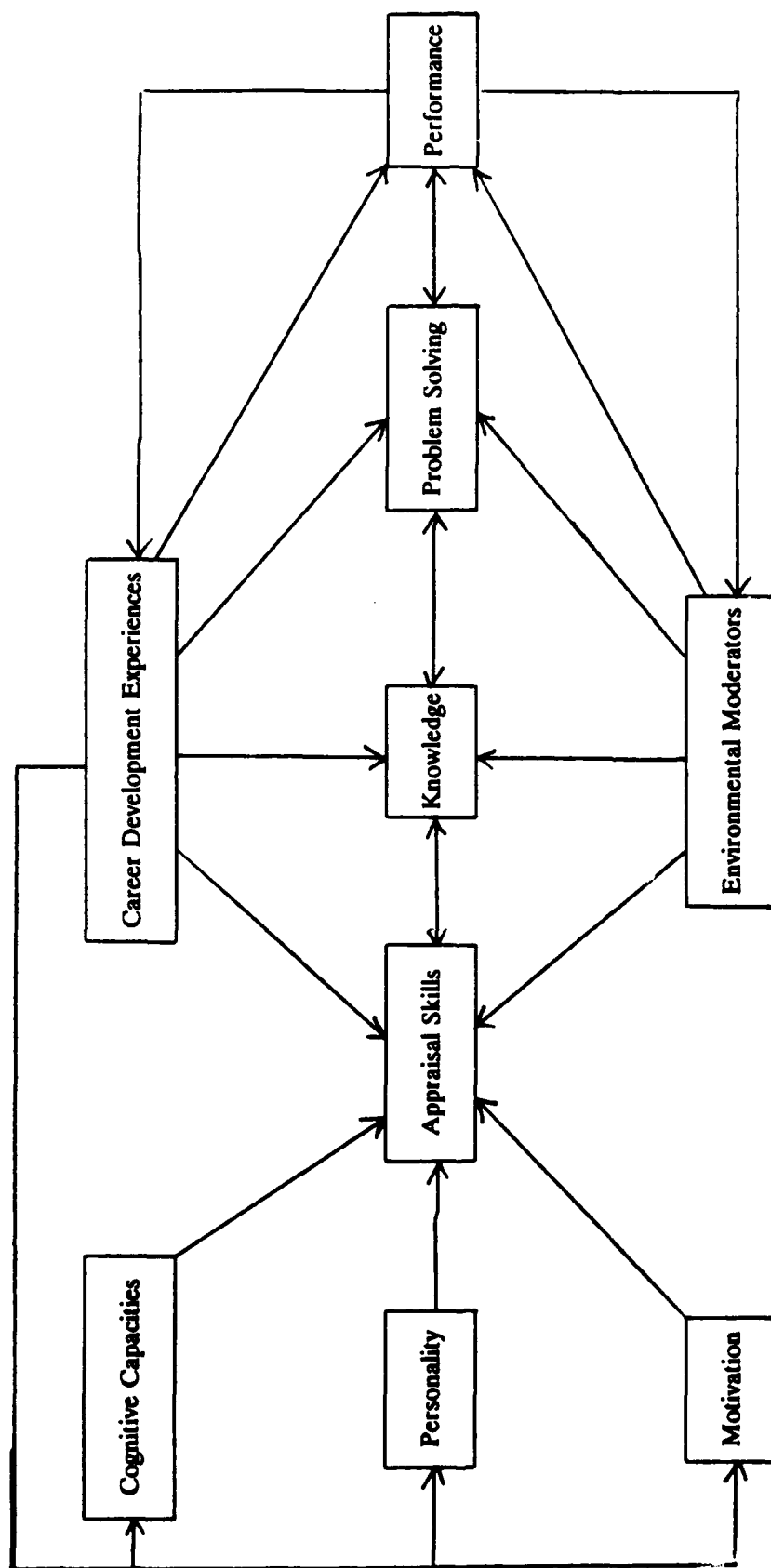
be targeted in developmental interventions. The resulting set of key leadership qualities is likely to include a number of interconnected characteristics, each perhaps necessary, but not sufficient in its influence on leadership; indeed, prior efforts based on leader trait theory can be faulted either for their reliance on too few qualities to account for much variance in performance or for their failure to consider interactions among sets of variables as determinants of leadership.

We have defined leadership as discretionary problem solving in ill-defined social domains. Further, problem solutions must be implemented under conditions that entail multiple constraints. This definition and the leader behavior taxonomy indicate two basic processes that should be reflected in the characteristics of effective organizational leaders (Mumford, O'Connor, Clifton, Connelly, & Zaccaro, 1991). The first is problem construction and solution generation, which include the processes and behaviors of information acquisition and organization, the specification of group and organizational needs, planning, and the development of strategic responses (Mumford & Connelly, *in press*; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991; Mumford, Reiter-Palmon, & Redmond, *in press*). Such processes occur in domains where problems are likely to be highly variable in demand characteristics and are also likely to require relatively novel approaches. This suggests a need for controlled processing in leadership that places a premium on intelligence, creativity, and constructive skills that increases with problem variability and complexity (Jacobs & Jacques, 1989; Murphy, 1989). Further, problem novelty necessitates creative processes, suggesting skills related to problem definition and idea fluency.

The second basic process that is to be reflected in leader qualities is the implementation of solutions in social domains. This process underscores the importance of motivational constructs, such as achievement, need for power, and energy that contribute to one's willingness to generate and implement problem solutions. Further, the social embeddedness quality of leader problem solving highlights the importance of such social skills as dominance, empathy, and social adroitness (Zaccaro, Gilbert, Thor, & Mumford, *in press*). The acquisition of tacit knowledge that corresponds to the use of practical intelligence skills within the specific organizational context is also of critical importance (Wagner & Sternberg, 1985). Finally, certain personality dimensions, including sociability and self-esteem, might influence an individual's willingness or capability for solving the kind of problems presented to leaders (Bray, Campbell, & Grant, 1974; Fiedler, 1978).

These notions suggest a categorical process model (McGuire, 1983) of knowledge, skills, abilities, and personality constructs (KSAPs) that condition successful organizational leadership. This model, shown in Figure 3, is a process one in that three exogenous sets of variables, cognitive generating factors, personality characteristics, and personal values and motives, are proposed as determining the quality of a leader's appraisal and solution implementation skills in the organizational context. The practice of these skills in turn increases the leader's specific capabilities and declarative knowledge structures as an organizational incumbent.

This model is also a categorical one in that each causal dimension contains similar but independent subdimensions that represent its critical components. For example, cognitive generating factors include general cognitive intelligence, creativity, and cognitive abilities. Further, each of these subdimensions contains a number of more specific characteristics or KSAPs that condition its occurrence. Thus, for example, general intelligence subsumes the processes of problem anticipation, deductive reasoning, inductive reasoning, and time sharing.



The identification of the specific KSAPs in this model was based on a procedure similar to Fleishman's (1975) Ability Requirements Approach that has been used successfully in previous attempts to specify KSAP taxonomies (e.g., Fleishman & Mumford, 1989b; Fleishman & Quaintance, 1984; Mumford, Yarkin-Levin, Korotkin, Wallis, & Marshall-Mies, 1985). In this approach, the initial step is to define and describe the nature of the tasks that are being performed. In the present effort, this step is reflected in our definition of organizational leadership, the taxonomy of leadership behavior, and the corresponding validation studies. Next, a broad list of KSAPs is specified from (a) the nature of the tasks to be performed, and (b) the literature pertaining to the measurement and description of individuality. In the present effort, potential KSAPs were selected from a broad literature on individual differences, human performance, and achievement behavior. Further, the more specific literature on individual differences and leadership (e.g., Bass, 1981, 1990) was scoured for additional constructs.

In the next step, six psychologists and graduate students who were familiar with the definition of organizational leadership and the corresponding taxonomy reviewed each construct to determine the degree to which it facilitated individual problem-solving behaviors. Thus, this process required the specification of general cognitive factors, personality variables, and individual motives that condition problem construction and solution generation across general achievement domains. Further, reviewers selected intelligence skills, personality characteristics, and motives that influence information acquisition and appraisal as well as the implementation of generated solutions in specific dynamic and complex social systems.

The final step in this specification of leader KSAPs was another review of the list generated through the aforementioned steps, but this time based on a more precise description of leadership as creative problem-solving (Mumford & Connelly, in press). Creativity is reflected in the production of novel, socially-valued products (Albert, 1975; Amabile, 1983; Briskman, 1980; Busse & Mansfield, 1980; Gardner, 1988; Ghiselin, 1963; Hocevar, 1981; Nicholls, 1976). This definition implies that creativity should be viewed as an interactional syndrome involving five basic kinds of variables (Mumford & Connelly, in press; Mumford & Gustafson, 1988): (a) processes contributing to the individual's capacity to generate new ideas or novel problem solutions; (b) characteristics of the individual facilitating process operation; (c) characteristics of the individual facilitating the translation of these ideas into action; (d) attributes of the situation influencing the individual's willingness to pursue these ideas; and (e) attributes of the situation influencing evaluation of the productive effort. Creative problem solving differs from more routine forms of problem solving in that it typically occurs in ill-defined domains, where the nature and existence of the problem is poorly specified and, in fact, must often be generated by the individual (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Further, in contrast to routine problem-solving, creativity calls for the generation of new knowledge or the application of extant knowledge in new ways. In addition, novel problem solutions require the systematic combination or reorganization of extant schemata (Hausman, 1988; Mumford & Gustafson, 1988; Rothenberg, 1986). These new, ad hoc categories (Barsalow, 1982, 1988, 1989) provide a basis for the generation of problem solutions which are at least novel to the individual at hand, if not the broader setting.

Given these descriptions, a strong argument can be made that leadership, defined as discretionary problem solving in ill-defined domains, is closely associated with creativity and its component cognitive processes (Mumford & Connelly, in press; see also Bray, et al., 1974; Cushmir & Koberg, 1986; DeVeau, 1976; Sinetar, 1985). Accordingly, the final specification of leader KSAPs in the present effort was based on a reappraisal by the six prior reviewers as to whether a particular construct facilitated creative problem-solving in ill-defined social domains.

This final review yielded 65 specific KSAPs, grouped into four causal dimensions and 11 subdimensions. These KSAPs are presented in Table 5. Definitions of each construct are also presented in Appendix C. What follows is a description of each causal dimension, its subdimensions, and the embedded KSAPs.

### **Cognitive Generating Factors**

The personal constructs in this dimension include the individual cognitive capacities related to effective problem construction and solution generation. Given the nature of organizations and their embedding environments, leaders need to be able to quickly encode multifaceted, dynamic, and highly variable stimuli. They also need to integrate and reason from such information to produce useful and, in many instances, novel solutions to goal-related problems. As noted earlier, these processes often necessitate the recombination of extant schemata or the formation of new cognitive representations. Thus, organizational leadership frequently involves representational thinking to create mental models and cognitive representations of the organizational world that, in turn, facilitate organizational problem solving. The literature on problem solving suggests three sets of more specific factors that determine the efficacy of such processes (Ackerman, 1986; Sternberg, 1986; 1988). These are general cognitive intelligence, creativity, and crystallized cognitive skills.

**General Cognitive Intelligence:** Key elements of the creative problem solving process in ill-defined domains include the manipulation of extant knowledge structures, the development of new knowledge structures, and the generation of novel ideas (Mumford & Connelly, in press; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991; Mumford, Reiter-Palmon, & Redmond, in press). If it is granted that general intelligence represents the individual's ability to formulate and apply abstract concepts (Humphreys, 1979; Tyler, 1965), then its significance for these processes becomes readily apparent. More specifically, when the concepts underlying category use are difficult to formulate (Mumford & Gustafson, 1988) or when new categories must be formulated quite rapidly (Murphy, 1989), one would expect intelligence to have a marked impact on problem-solving performance. High general intelligence is also associated with the development of more complex procedural knowledge structures (or "interpretative rules"; Cantor & Kihlstrom, 1987) that in turn facilitate the acquisition, encoding, and utilization of information, particularly in novel or difficult social problem contexts (Cantor & Kihlstrom, 1987; Smith, 1984; Zaccaro et al., in press).

General intelligence has been perhaps the individual characteristic most often associated with leadership performance in prior research. Stogdill (1948) reported 23 studies that found leaders to be higher in intelligence than followers; only five studies showed no differences. Mann (1959) reported that 88% of the results across 28 studies indicated a positive relationship between general intelligence and leadership. Recent meta-analyses of this relationship indicate that intelligence measures yield mean correlations of about .50 with leadership outcome measures after correcting for attenuation and range restriction effects (Cornwell, 1983; Lord, De Vader, & Alliger, 1986). Other studies by Ball (1933), Horner (1983), and Terman and Oden (1959) indicate that intelligence is related to movement into, as well as performance in, leadership positions. Moreover, Kanter (1977) and Pelz (1953) found that the relationship of intelligence to leader performance increased with movement up the organizational hierarchy.

We note that while these results attest to the significance of intelligence for leadership, Fiedler and Garcia (1987) argue that the application of this, and perhaps other, requisite cognitive resources may be influenced by situational factors that limit the feasibility and

**Table 5. Proposed Leadership KSAPs**

Cognitive Generating Factors	Personality
<ol style="list-style-type: none"> <li>1. General Cognitive Intelligence <ol style="list-style-type: none"> <li>A. Problem Anticipation</li> <li>B. Inductive Reasoning</li> <li>C. Deductive Reasoning</li> <li>D. Time Sharing</li> </ol> </li> <li>2. Creativity <ol style="list-style-type: none"> <li>A. Definition of Problem</li> <li>B. Fluency</li> <li>C. Originality</li> </ol> </li> <li>3. Crystallized Cognitive Skills <ol style="list-style-type: none"> <li>A. Oral Comprehension</li> <li>B. Written Comprehension</li> <li>C. Oral Expression</li> <li>D. Written Expression</li> <li>E. Information Ordering</li> <li>F. Selective Attention</li> <li>G. Technical Ability</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Adaptability/Ego Resiliency <ol style="list-style-type: none"> <li>A. Performance Motivation</li> <li>B. Adaptability</li> <li>C. Emotional Control</li> <li>D. Energy Level</li> <li>E. Risk Taking</li> <li>F. Self-Esteem</li> <li>G. Sensing</li> </ol> </li> <li>2. Openness/Curiosity <ol style="list-style-type: none"> <li>A. Cognitive Complexity</li> <li>B. Openness to Experience</li> <li>C. Investigative</li> <li>D. Tolerance for Ambiguity</li> <li>E. Intuition</li> <li>F. Thinking</li> <li>G. Perception</li> </ol> </li> <li>3. Self-Awareness <ol style="list-style-type: none"> <li>A. Internal Locus of Control</li> <li>B. Tolerance for Failure</li> <li>C. Self-Appraisal</li> <li>D. Discretion (Ego Control)</li> </ol> </li> </ol>
Values and Motives	Embedded Appraisal and Implementation Skills
<ol style="list-style-type: none"> <li>1. Achievement <ol style="list-style-type: none"> <li>A. Achievement</li> <li>B. Autonomy</li> <li>C. Self-Expression</li> <li>D. Mastery Motives</li> </ol> </li> <li>2. Need for Dominance <ol style="list-style-type: none"> <li>A. Enterprising</li> <li>B. Political</li> <li>C. Need for Power</li> <li>D. Judgment</li> </ol> </li> <li>3. Commitment to Social Systems <ol style="list-style-type: none"> <li>A. Responsibility</li> <li>B. Social</li> <li>C. Social Alienation (-)</li> <li>D. Object Belief (-)</li> <li>E. Coaching</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Practical Intelligence <ol style="list-style-type: none"> <li>A. Monitoring Goal-Relevant Cues</li> <li>B. Selection of Solution Components</li> <li>C. Information Appraisal</li> <li>D. Prioritizing</li> <li>E. Information Gathering and Encoding</li> <li>F. Planning and Implementation</li> <li>G. Implementation of Solution</li> <li>H. Evaluation of Discrepancy Importance</li> <li>I. Monitoring Implementation and Solution Outcomes</li> <li>J. Problem Sensitivity</li> <li>K. Administrative Skills</li> </ol> </li> <li>2. Social Intelligence <ol style="list-style-type: none"> <li>A. Negotiation Skills</li> <li>B. Interpersonal Sensitivity</li> <li>C. Social Confidence</li> <li>D. Empathy</li> <li>E. Social Adroitness</li> <li>F. Norm Sensitivity (Social Conformity)</li> <li>G. Adherence to Procedures</li> <li>H. Feeling</li> <li>I. Wisdom</li> </ol> </li> </ol>

effectiveness of problem solving efforts. These factors may include a lack of directiveness by the leader (Blades & Fielder, 1973), a lack of motivation, cohesion, or support in the work group (Fiedler & Meuwese, 1963; Fiedler & Leister, 1977), and undue supervisor-based stress brought about by conflict or overload (Fiedler, Potter, Zais, & Knowlton, 1979; Potter & Fiedler, 1981). The relationship between intelligence and leader performance can also be affected by a significant disparity between the leader's intelligence and that of his or her subordinates (Stogdill, 1948; Gibb, 1969; Bass, 1990). In essence, based on the literature examining climatic influences on creative achievement (Abbey & Dickson, 1983; Andrews, 1985; Hennessey & Amabile, 1988; Pelz, 1956; Taylor, 1972; Witt & Beorkrem, 1989), one might anticipate that lack of goals emphasizing the need for effective problem solving, a culture of mediocrity, low trust, an emphasis on social conformity, poor communication, limited support, intolerance of error, and the lack of requisite resources would all act to influence the likelihood of effective application of various cognitive resources. This suggests that other noncognitive characteristics, such as dominance, independence, self-confidence, performance standards, high task or organizational commitment, resistance to stress, and social adroitness, play important roles in leadership by permitting individuals to apply cognitive resources more effectively under adversity. The interactive possibilities of these characterological factors, which are represented elsewhere in this model of leader KSAPs, have received relatively scant attention in the leadership literature.

The subdimension of general cognitive intelligence includes four specific characteristics: problem anticipation, deductive reasoning, inductive reasoning, and time sharing. These individual qualities have in common the manipulation and encoding of information within complex and uncertain contexts (Fleishman, 1975; Fleishman & Quaintance, 1984). The results of these operations are formations of new knowledge structures or the elaboration of existing ones that are in turn used in subsequent planning and solution implementation. Individuals who possess high levels of these capabilities can perform more successfully several important steps in creative problem solving, including problem construction, information encoding, category search, specification or reorganization of knowledge categories, and idea evaluation (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Problem anticipation, or the extent to which one foresees potential difficulties in a given situation, is particularly useful for goal-related diagnosis of events in the dynamic and complex environment that often confronts organizational leaders. Both inductive and deductive reasoning facilitate the development of knowledge structures, with deductive reasoning being particularly useful in solution generation. Finally, given that leadership often necessitates attention to multiple information sources, time sharing capabilities also represent a critical component of successful discretionary problem-solving.

**Creativity:** Creativity is a second subdimension of cognitive generating factors. Organizational problem-solving often requires leaders to generate novel and innovative solutions (Mumford & Connelly, in press); such processes are conditioned by specific individual capabilities related to creativity. Of particular relevance, and subsumed under this KSAP dimension, are three skills related to divergent thinking (Guilford, 1950; Mumford & Gustafson, 1988), which refers to an individual's ability to generate multiple potential solutions to a problem. The first is problem definition, which involves a determination of what precisely is the problem, what its parts are, and how these parts are related to one another (Dillion, 1982; Getzels, 1975; Getzels & Czikszentmihalyi, 1975, 1976; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Idea generation proceeds more effectively from a firm understanding and representation of the problem that is provided by high levels of problem definition skills. A second skill is ideational fluency, which refers to the ability to produce a large quantity of ideas in response to a problem (Fleishman & Quaintance, 1984). This capability, however, refers only



to the number of ideas produced, not to their quality. Accordingly, the third specific capability is originality, defined specifically as the ability to produce innovative or creative ideas (Fleishman & Quaintance, 1984). Taken together, these three capabilities condition the leader's generation of novel solutions to complex goal-related problems posed by the organization's environment. Indeed, several studies have provided evidence for a significant relationship between divergent thinking capabilities linked to creativity and leadership performance (e.g., Bray, et al., 1974; Cushmir & Koberg, 1986; Rusmore, 1984; Sinetar, 1985).

**Crystallized Cognitive Skills:** The third category making up cognitive generating factors includes skills with a potential based in general intelligence, but that have been manifested through extensive experience across multiple, different problem solving contexts. The utilization of these skills facilitates the acquisition, manipulation, and exchange of information in a manner applicable to most if not all problem scenarios. Seven specific skills are subsumed under this dimension (Fleishman & Mumford, 1988; Fleishman & Quaintance, 1984). The first two are oral and written comprehension, which refer to the ability to understand language expressed in oral and written form. The next two cognitive skills, oral and written expression, indicate the ability to utilize language in oral or written form to communicate information (Boyatzis, 1982). These skills facilitate the acquisition and exchange of information in problem solving efforts. A fifth skill included in this category is information ordering, or the ability to apply standards to given information in order to arrange it into the best or most appropriate sequence. This skill is most useful in knowledge structuring and encoding aspects of problem solving. As Fleishman and Quaintance (1984) point out, this skill reflects rule following rather than the manipulation of information, *per se*. Selective attention, the sixth skill in this category, refers to the ability to concentrate on the problem or task on hand and not be distracted. Technical ability, the final skill, reflects general knowledge in task-relevant domains. For leaders, examples of this component may include computer skills and mechanical abilities.

## **Personality**

While the need to consider cognitive generating factors in the prediction of leader performance cannot be understated, they are not sufficient for adequate prediction; several other sets of variables are also necessary. Variables, such as individual motivation, willingness to act, the disposition to perform in complex and ambiguous contexts, and the skills that facilitate action in constrained (and constraining) social environments must also be considered. Among the most important of such determinants are personality variables that dispose the leader toward using general cognitive skills and processes to solve organizational problems. Also, in some cases, personality characteristics related to cognitive flexibility and openness will facilitate certain cognitive operations. Over the years, a number of studies examining the personality attributes related to innovative achievement have been conducted (e.g., Albaum, 1976; Albaum & Baker, 1977; Chambers, 1964; Gough, 1979; MacKinnon, 1962; Morrison, Owens, Glennon, & Albright, 1962; Owens, 1969; Roe, 1953).

In recent years it has become apparent that certain core characteristics are consistently related to creative accomplishments across occupational fields. Barron and Harrington (1981) concluded that the set of such personality characteristics includes intellectual values, attraction to complexity, high energy, a concern with work and achievement, independence of judgement, autonomy, intuition, self-confidence, ability to tolerate and resolve conflict, and a creative self-image, though the last may be confounded with rejection of convention. Two potential explanations exist for the influence of these core constructs (Mumford & Gustafson, 1988). The first is that in some manner they facilitate the creation of new understandings through the

integration and reorganization of knowledge structures. These variables may also facilitate the development of more comprehensive understandings. Attributes such as intellectual values, a preference for complexity, and a tolerance for ambiguity tend to increase the probability that the individual will (a) have multiple perspectives or understandings available, (b) be willing to use multiple understandings in problem-solving efforts, (c) be sensitive to information that is inconsistent with a given understanding, and (d) be willing to resolve conflicting facts or understandings. Thus, differential characteristics of this sort might be conceived of as contributing to the development and use of complex schemata.

A second potential explanation for the influence of these core personality characteristics derives from the fact that at some point in the problem-solving process, new understandings or solutions must be translated into action. To accomplish this translation, an individual must be capable of making a public commitment to a new idea and of subsequently abandoning other potential solutions/activities to ensure that this idea will become viable (Motamedi, 1982). Moreover, because by definition this idea will be new and untried, the individual will often lack strong social approval for the value of this endeavor. These conditions indicate the importance of autonomy, self-confidence and ego-resiliency, independence, high energy, and a willingness to work as determinants of creative problem-solving. Taken together, this second set of core characteristics can be conceived as general personality attributes required for implementing ideas and solutions within the broader context of the leader's personal and social world.

In sum, personality characteristics influence leader performance by (a) promoting a willingness and energy to solve problems in ambiguous performance settings; (b) providing the cognitive flexibility to acquire, encode, and manipulate information in such settings; and (c) allowing a sense of individualism that is resilient in the face of uncertainty and potential failure. Personality variables corresponding to these effects are subsumed under three subcategories: adaptability/ego resiliency, openness/curiosity, and self-awareness.

**Adaptability/Ego Resiliency:** This subdimension includes characteristics that foster the motivation to work hard in uncertain, difficult, and variable performance settings. To be successful in such settings, leaders need to have the energy and drive to confront difficult challenges. They also need to have a sense of self that allows boldness under uncertainty as well as an adaptability to changing performance demands (Boyatzis, 1982). Accordingly, this subdimension incorporates seven personality variables. Three of these, performance motivation, adaptability, and energy level reflect the disposition to work hard, persist, and adapt to changing environmental factors (Boyatzis, 1982; Brown & Howerth, 1977; Dawis & Lofquist, 1984; McClelland, Atkinson, Clark, & Lowell, 1953; Thomas & Chess, 1977). Three other variables, emotional control, risk taking, and self esteem, represent a sense of ego strength and self-assurance that allows the leader to take chances in solving organizational problems, while having the confidence to perform in sometimes difficult interpersonal or social situations (Boyatzis, 1982; Carney, 1971; Caspi, 1987; Diener, 1984; Frost, Fiedler, & Anderson, 1983; Funder & Block, 1983). The final variable in this set is sensing (Myers & McCaulley, 1985), which refers to an individual's preference for acquiring facts and conveying information that is realistic and practical.

**Openness/Curiosity:** This subdimension includes personality variables that facilitate the cognitive complexity and flexibility to solve problems in an uncertain environment where information is often quite ambiguous. A key element of this subdimension is a sense of curiosity on the leader's part that promotes exploration of new areas and domains (Keller, 1983; McCrae & Costa, 1987). This quality helps leaders in their dealings with novel problems and in

developing novel solutions. Personality variables corresponding to this quality that are included in this subdimension are openness to experience and tolerance for ambiguity (McCrae & Costa, 1987; Barron & Harrington, 1981). A second key factor reflects a determination to pursue and understand complex material. Given the informational demands on the leader posed by an uncertain and dynamic organizational environment, problem solving is made easier by a personality that promotes the persistent acquisition and structuring of ambiguous information until a sufficient understanding is attained. Personality factors subsumed here include cognitive complexity (Crocket, 1965) and dispositional preferences for investigation, thinking, perception, and intuition (Myers & McCaulley, 1985).

**Self-Awareness:** Leaders often need to promote problem solutions that have little or no initial social support. Further, the tendency toward risk-taking discussed earlier will increase the probability of failure in a larger number of problem situations. Accordingly, a leader needs a sense of individualism that provides (a) goal-based persistence in the face of social obstacles, and (b) personal strength to avoid becoming immobilized by the threat or actual occurrence of failure (Boyatzis, 1982; Peterson & Seligman, 1984). Four factors are included in this subdimension. The first is internal locus of control, which refers to a person's tendency to take full responsibility for his or her achievement outcomes and to believe that one's "life chances" are under personal control. This construct promotes strength of belief in a particular goal path and a corresponding task persistence even in the face of failure (deCharms, 1968; Peterson & Seligman, 1984; Rotter, 1966; 1982; Tyler, 1978). A second and related factor is a tolerance of failure, which provides a sense of resiliency and encouragement after the occurrence of failure (Clifford, Kim, & McDonald, 1988). The remaining two personality factors, self appraisal and discretion (or ego control), reflect a self concept of independence in the problem-solving process (Funder & Block, 1989). These qualities allow leaders to make decisions when initial social support is lacking and to evaluate themselves in relation to established plans and goals. Research by Bray et al. (1974) on "self-objectivity" and by Boyatzis (1982) on managerial competence related to accurate self-assessment attest to the importance of these constructs for organizational leadership performance.

### **Values and Motives**

While the aforementioned personality variables represent dispositions that promote goal-oriented achievement in many environments, personal values and motives that condition a leader's attempts at influence within particular or chosen organizational settings are also important. This is the focus of the next set of proposed leadership qualities. These constructs reflect three particular aspects of organizational leadership, (a) the accomplishment of important and challenging tasks; (b) the striving for and utilization of power (Pfeffer, 1977, 1981); and (c) the individual's commitment to work hard on behalf of organizational goal attainment at the expense of personal goals. These conditions suggest three subdimensions under this category, achievement, need for power, and commitment to social systems.

**Achievement:** Several achievement-related personality variables have already been linked to leader effectiveness in this model. Such variables reflect a desire to accomplish difficult tasks or a "concern with doing something better" (Boyatzis, 1982, p. 62). In essence, they condition a willingness to perform complex tasks posed by the organizational environment. The achievement values represented by the present subdimension refer instead to a desire to build or create something new and/or innovative and also a motivation to master new performance domains. In this instance, a leader is carving a personal achievement niche that becomes his or her own contribution to the organization. Four constructs are subsumed under this dimension.

The first is achievement, defined as the extent to which an individual views personal achievement as particularly important in terms of a life goal (Dawis & Lofquist, 1984; Super, 1962). The second construct is autonomy which refers to the individual's desire for freedom of action within achievement domains. The importance of autonomy as a desired value is indicated by Hackman and Oldham (1980) who argue that individuals high in growth need strength (and therefore exhibiting some of the values in this dimension) are motivated by job environments that provide personal independence in decision-making and task accomplishment. The remaining values in this set are self expression and mastery motives. Both values reflect desires to maximize one's own learning and performance potential (Dweck, 1986; Dweck & Leggett, 1988). The leader possessing strong levels of these values seeks to continually extend the boundaries of his or her own achievement capabilities. These values are particularly critical because they condition the growth and development of leaders as they proceed through their career paths. Self expression and mastery motives may also differentiate individuals who "stagnate" after reaching upper levels of organizational leadership from those who continue to exhibit a strong degree of vitality and innovativeness.

**Need for Dominance:** Many investigations of leader characteristics have emphasized dominance and a need for power as critical qualities (e.g., Bass, 1990; Boyatzis, 1982; Lord, Devader, & Alliger, 1986; McClelland, 1975; McClelland & Boyatzis, 1982). In essence, leaders must be willing to exert control and influence over subordinates. The goal however is not personal aggrandizement but primarily the advancement of organizational goals. For example Bass (1990, p. 129) notes that

"... entrepreneurs (individuals who behave innovatively in large complex organizations are task-oriented personnel who use power whenever they can to ensure that their ideas, inventions, and innovations are accepted in their organizations (Pinchot, 1985). Such entrepreneurs regard power as being instrumental for the accomplishment of tasks and as something they share with others, rather than as a basis for personal aggrandizement."

Four values comprise this set. The first, defined as enterprising, reflects Bass's quality of entrepreneurship. It refers to a preference for activities that involve the manipulation of personnel to achieve organizational goals (Holland, 1976; Peterson & Bownas, 1982). The second value, judgment, indicates a preference for control in one's life and a desire to make decisions in a rapid and orderly manner (Myers & McCaulley, 1985). The final two constructs in this set, political and need for power, represent more generic motives for influence and control over one's social environment, whether for organizational gain or personal goal attainment.

**Commitment to Social Systems:** Several theories of leadership have emphasized the developmental or transformational role of organizational leaders (Bass 1985; Boyatzis, 1982; Burns, 1978; Howell, 1988; Manz & Sims, 1990). In essence, part of leadership involves the nurturing of subordinate capabilities. Indeed, research by Bass and his colleagues (Bass, 1990; Hater & Bass, 1988) indicates that appraisals of leadership potential by one's superior were associated with an individual's perceived transformational qualities. These views of leadership do not mean, however, that the leader's primary goal is subordinate development. In such actions, the leader is still acting in service to the organizational; the development of subordinate KSAPs can facilitate the implementation of problem solutions and action plans. In this regard, such development allows leaders to garner a higher "return rate" in terms of social exchanges with their subordinates. Also, discretionary problem-solving often requires hard work and, at

times, great personal sacrifice. Accordingly, successful leaders need to possess a great sense of responsibility to the members of their role set (i.e., immediate and extended superiors, subordinates, and coworkers; Katz & Kahn, 1978) as well as a strong commitment to the organization as a whole. This latter quality has been demonstrated in studies that report greater organizational commitment being exhibited by leaders than by nonleaders (e.g., Zaccaro & Collins, 1988).

This subset of values and motives contains five variables that condition commitment to a social system. The first, responsibility, reflects a strong obligation for honesty and dependability (Gough, 1957; Jackson, 1976). The key element in individuals with high levels of this characteristic is a strong sense of duty and obligation to members of their work role set. The second value is social (Boyatzis, 1982; Allport, Vernon, & Lindzey, 1960), which reflects a preference for training and developmental activities. Leaders high on social values, not only view such activities as important, but also exhibit a strong desire for engaging in them as part of their role. A third and related value, coaching, includes providing guidance and encouragement in term of professional development (Fine, 1988; Kram, 1986). Coaching activities are not limited to skill development, but also include the inculcation of professional norms, the translation of organizational rules and expectations, and other related socialization activities. In essence, this value reflects the leader as mentor (Clawson, 1980; Collins & Scott, 1978). The two remaining values in this set are distinguished by the negative impact of their presence on system commitment. One variable, social alienation, reflects a disengagement from social groups and an indifference to the needs of the personnel in one's work role set. Another personal characteristic, object belief, defines an orientation to use others as instruments for personal goal attainment. Individuals manifesting a strong sense of object belief feel little remorse about achieving their own interests through a callous manipulation of others. These latter values obviously orient the individual away from system goal attainment and toward self-aggrandizement.

### **Embedded Appraisal and Implementation Skills**

The three variables sets of cognitive generating factors, personality variables, and values and motives are viewed as causal factors that determine high level achievement across most social domains. However, once an individual has selected a niche within a broad social environment, these factors condition the development and utilization of appraisal and implementation skills within that niche. These factors do not represent declarative and procedural knowledge sets specific to a particular organization, although such knowledge clearly results from the practice of these skills; instead the qualities in this dimension reflect problem-solving capabilities that are applicable across a variety of organizational settings within an occupational domain. The nature of organizations as open social systems and problem solving domains suggest two sets of embedded appraisal and implementation skills--practical or problem-solving intelligence and social intelligence.

**Practical Intelligence:** The qualities making up this set facilitate organizationally goal-oriented problem solving behaviors (Charlesworth, 1976; Mumford, 1986; Resnick & Glaser, 1976; Sternberg, Conway, Ketron, & Bernstein, 1981). As such, three cognitive operations can be identified, (a) information acquisition and appraisal, (b) planning and solution implementation, and (c) monitoring and feedback. Practical intelligence qualities in this set that are related to the first operation are problem sensitivity, monitoring and assessment of goal relevant cues, information gathering and encoding, and information appraisal. Qualities related to the second operation include selection of solution components, planning, prioritizing,

administrative skill, and solution implementation. The third operation of monitoring implementation includes skills related to evaluation of discrepancy information and monitoring solution outcomes. The specific definitions of these skills are provided in Appendix C.

It may be worth noting that some of the KSAPs discussed earlier in the development of this categorical process model appear to be conceptually similar to those offered here. Perhaps the most obvious similarity is among problem sensitivity, problem anticipation, and problem definition. However, problem anticipation reflects an ability to perceive a potential disruption as (or even before) relevant information becomes available; problem definition refers to an ability to define the scope and dimensions of an emerging problem. Both of these operations require general abstract reasoning skills. Problem sensitivity involves an ability to perceive what has gone wrong or likely to go wrong in a particular task domain. It requires a more concrete understanding of the task and its operational procedures. Thus, it reflects problem awareness within a specific organizational domain. Similar distinctions between abstract reasoning skills and embedded problem-solving skills can be discerned across most of the KSAPs subsumed here and under the dimension of cognitive generating factors. Most importantly, however, we emphasize that cognitive generating factors condition the efficacy of the practical intelligence skills outlined here (Mumford, 1986). Likewise, the three exogenous variable sets in our model (particularly values related to need for power and commitment to social systems) condition the skills related to social intelligence.

**Social Intelligence:** Effective leaders have a degree of social competence that results in accurate perceptions of social requirements and the selection of appropriate behavioral responses (Zaccaro, Foti, & Kenny, 1991; Zaccaro, Gilbert, Thor, & Mumford, in press). This competence is vital both for the interpretation of social problems and for the subsequent implementation of solutions within complex and dynamic social environments. Indeed, a number of theorists have noted the failure of intellectually gifted individuals placed in leadership roles because a lack of social competence skills precluded effective social interaction (Bass, 1990; Boyatzis, 1982; Bureau of Public Personnel Administration, 1930; House & Baetz, 1979; Moss, 1931; Yukl, 1989). Such skills are defined as dimensions of social intelligence (Cantor & Kihlstrom, 1987; Marlowe, 1986; Thorndike, 1920; Walker & Foley, 1973; Zaccaro et al., in press). More specifically, Marlowe (1986) defined social intelligence as the "ability to understand the feelings, thoughts, and behaviors of persons, including oneself, in interpersonal situations and to act appropriately upon that understanding" (p. 52). Thus, social intelligence incorporates two basic components, identified by Zaccaro et al. (in press) as social perceptiveness and behavioral flexibility (Moss & Hunt, 1927; Vernon, 1933; Cantor & Kihlstrom, 1987; Thorndike, 1920; Thorndike & Stern, 1937). Social perceptiveness refers to an ability to be aware of social affordances (Baron & Boudreau, 1987; McArthur & Baron, 1983) specified in dynamic social systems. It means an awareness of needs, goals, demands, and problems at multiple system levels, including individual organizational members, relations among members, relations among organizational subsystems, and interactions among a leader's constituent organization and other systems in the broader embedding environment. Individual qualities included in this variable set are interpersonal sensitivity, empathy, feeling, wisdom, and norm sensitivity (Bass, 1960, 1990; Bell & Hall, 1954; Chowdhry & Newcomb, 1952; Taft, 1955).

Behavioral flexibility can be characterized as an ability and willingness to respond in significantly different ways according to variable social demands (Boyatzis, 1982; Ford, 1986; Paulus & Martin, 1988). This skill includes not only selecting responses in accordance to situational requirements, but also the ability to persuade and influence personnel having different needs, goals, and agendas. Indeed, implementation of problem solutions very often

requires leaders to negotiate their actions through social "mine fields". Accordingly, the personal skills included among the variables that condition behavioral flexibility are negotiation skills, social adroitness, social confidence, and adherence to procedures. Wisdom and norm sensitivity also contribute to selected social responses. More specific definitions of these KSAPs are presented in Appendix C.

### **Knowledge**

The utilization of practical and social intelligence skills results in the formation of declarative knowledge structures (Cantor & Kihlstrom, 1987; Smith, 1984) that condition success in particular settings. These knowledge structures include organizationally-specific social information about "kinds of people", "kinds of situations", and "kinds of social episodes" (or the actions of kinds of persons within specific situations) (Cantor & Kihlstrom, 1987, p. 79). Wagner and Sternberg (1985) identified a similar form of such knowledge as tacit knowledge. They specified three categories of tacit knowledge that are critical for organizational leadership. The first, managing self, refers to "knowledge about how to manage oneself on a daily basis so as to maximize one's productivity" (p. 439). The second is managing others, which includes "knowledge about managing subordinates and one's social relationships" (p. 439). Both of these skills facilitate problem-solving and goal attainment within a chosen organizational domain. The last tacit knowledge structure, managing career, reflects an orientation that extends beyond a specific organizational setting to the development of a successful career.

This dimension also includes knowledge that corresponds to the technical performance of organizational tasks. The specific content of such knowledge structures will depend on the nature of a particular organization, as well as on the individual's specific jobs or tasks. Thus, for example, Mumford, Yarkin-Levin, Korotkin, Wallis, & Marshall-Mies (1985) identified multiple technical knowledges specific to military officers. Some of their examples are shown in Table 6.

### **Mediation**

The aforementioned leader KSAPs are organized into a categorical process model that is illustrated in Figure 3. A key point is that certain leader qualities are viewed as predeterminants of other qualities. Thus, the effects of cognitive generating capacities, personality constructs, and values and motives on leadership influence are mediated through their influences on the development of embedded appraisal skills. Further, the influence of such skills are mediated through task-specific and situation-specific knowledge. This model represents an advance over prior aggregations of leader characteristics not only because it is derived from an integrated theoretical perspective of organizational leadership, but also because individual qualities and dispositions are organized in a manner illustrating their causal interdependencies. Such a model clearly suggests the futility of studying a leader characteristic, or even limited sets of characteristics, in isolation.

### **Validation of KSAP model**

**Background Data Study:** In order to validate the proposed KSAP model, it is important to show that differential characteristics suggested by this model can predict leadership. For that purpose a study was carried out trying to predict adolescent leadership using background data scales. The sample used was obtained as part of a larger longitudinal investigation (Owens & Schoenfeldt, 1979). It contained 1037 men and 897 women who were freshmen at a large southeastern university in the fall of 1968. The sample members were asked to fill out a 389-

**Table 6. Examples of Officer Knowledges**

1. Military Tactics:	Has knowledge of operational procedures in combat (e.g., attack defend, delay, feint) and how they are to be carried out in a combat situation.
2. Military Strategy:	Has knowledge of long-range planning and extensive operations in order to achieve objectives of national policy.
3. Weapons Systems:	Has knowledge of the nature, maintenance, and potential uses of <u>available</u> armaments and the defense of units against such armaments.
4. Nuclear, Biological, and Chemical Warfare:	Has knowledge of nature, maintenance, potential uses of and authorization procedures for the application of nuclear, biological, and chemical weapons and the defense of units against these weapons.
5. Survival Techniques:	Has knowledge of requirements and strategies for survival in various physical environments.
6. Military Intelligence:	Has knowledge of the enemy and relevant geographic areas as well as the implications on training, tactics, logistics, etc.
7. Information Channels:	Has knowledge of how, when, and to whom information should be communicated and the appropriate channels for this communication.
8. Other Units:	Has knowledge of other units within the organization, particularly their responsibilities, current activities, capabilities, limitations, and procedures for obtaining support.
9. Logistics:	Has knowledge of logistic needs and the appropriate procedures for fulfilling these needs in an economical fashion.
10. Unit Goals:	Has knowledge of unit goals/missions, their priorities, and how they relate to the mission and goals of the Army.
11. Military Justice:	Has knowledge of the UCMJ and its application in particular situations.
12. Standard Operating Procedures:	Has knowledge of the routine operations which must be accomplished as well as the rules or procedures specifying how, when, and where they are to be accomplished or modified.
13. Informal Networks:	Has knowledge of the alternative, informal ways of accomplishing tasks within the organization.
14. Resources:	Has knowledge of the techniques for managing resources (e.g., personnel, facilities, equipment, time, and money) and how resources should be obtained in and retained allocated to meet unit goals.
15. Instruction:	Has knowledge of what must be trained and how, when, where, and by whom training should be given.
16. Evaluation:	Has knowledge of the appropriate procedures for appraising individuals (e.g., their capabilities and limitations) and programs.



**Table 6. Examples of Officer Knowledges (Continued)**

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17. Individual Guidance:	Has knowledge of the methods for eliciting needs and problems facing subordinates and the actions which may be taken in order to improve subordinates' military performance.
18. Morale:	Has knowledge of the general motivational level and organizational commitment of individuals and the steps which may be taken to improve them.
19. Personal Capabilities:	Has knowledge of the importance of personal strengths and weaknesses.
20. Military Life:	Has knowledge of military history, organization, traditions, protocol, deportment, rights, privileges, benefits, constraints, and obligations.
21. Military Behavior:	Has knowledge of how individuals are likely to behave in various military and social situations.
22. Science and Engineering:	Has knowledge of the basic principles of science and engineering.
23. Political and International Affairs:	Has knowledge of major trends and current issues in political, cultural, and world affairs and their implications for the military.
24. Physical Conditioning:	Has knowledge of the standards and requirements for maintaining one's physical capacity as it relates to unit goals.
25. Professional Ethics:	Has knowledge and understanding of the highest standards of fundamental values of the U.S. Army officer.
26. Professional Competence:	Has knowledge of requirements and standards for further professional development.
27. Recruitment and Retention:	Has knowledge of those individuals who should be retained by the organization and the strategies which may be used to ensure their retention.
28. Branch and Specialty Qualification:	Has knowledge of the particular requirements needed for his/her branch or specialty.
29. Staff Actions:	Has knowledge of procedures for achieving properly completed staff actions.
30. Contingency Plans:	Has knowledge of short-range planning for use of unit for combat, noncombat, and emergency operations.

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item background data questionnaire. A self-evaluation leadership scale was constructed using 19 background data items. Examples of items included in this scale were How often did you lead or direct others in group activities? and How many of the following leadership positions did you hold? The alpha coefficients obtained were .80 and .82 for men and women in the validation sample and .78 and .79 for men and women in the cross validation sample.

To identify constructs related to adolescent leadership, a variation on rational clustering procedures was used. Items were correlated with the scores on the leadership scale for the validation sample. Only items that yielded correlations greater than .10 and were significant at the .01 level were used in the cluster generation. Items were assigned by three psychologists into content clusters by grouping together items displaying similarity in item content and direction of the correlation. Item clusters were assigned into five categories: cognitive characteristics; motivational characteristics; social skills; personality characteristics; and developmental or input variables.

The scales constructed from the item clusters were then used in a blocked regression to assess their ability to predict leadership. In this analysis, each category of item clusters was entered in stepwise fashion until all of the clusters were represented. Cognitive characteristics were entered into the regression equation first, followed by motivational variables (block 2), social skills (block 3), personality characteristics (block 4), and developmental variables (block 5). The statistics of interest are the incremental changes in multiple Rs yielded by each entered set of constructs as well as the multiple R for the entire variable set. Table 7 summarizes the results of the blocked regression and presents the multiple Rs, cross validation Rs, and regression weights. As can be seen, the combination of the background data scales yielded unusually effective prediction. The multiple R was .82 for males and .81 for females in the validation sample. These Rs shrunk slightly to .72 for males and .78 for females in the cross validation sample. Cognitive factors were entered first and yielded multiple Rs of .41 and .44 for males and females, respectively. The strongest predictor in that block was inductive reasoning. The next block, which included motivation constructs, yielded a significant increment R of .26 ( $p < .01$ ). Multiple Rs increased to .67 for males and .66 for females. Also, all three constructs in this category (i.e., energy level, work ethic and achievement motivation) made a significant, positive contribution to the prediction of leadership. The next block entered was the social skills. The social skill scales resulted in a significant increment ( $p < .01$ ) in explained variance ( $R \text{ males} = .78$ ;  $R \text{ females} = .79$ ). All clusters yielded significant positive regression weights. The addition of the fourth block, personality characteristics, yielded a significant ( $p < .01$ ) but weak increment in prediction ( $R = .80$  for males and females). In the male sample, personal adjustment and positive temperament had significant regression weights; in the female sample, only self esteem produced a significant regression weight. The final block added included the developmental scales. The increment in the multiple R was significant ( $p < .01$ ) but also weak, with the R for the male sample being .82 and for the female sample, .81. For women, only the traditional values scale produced a significant regression weight. In the male sample non-parental support and family exposure yielded significant regression weights.

These findings provide some evidence for the validity of the proposed leader KSAP model. The regression analyses indicated that, as a set, cognitive constructs are strongly related to leadership activities, even in an adolescent sample where group problems are not highly complicated. These results also underscore the roles of motivational characteristics and social skills variables, such as persuasive dominance and social adjustment, in conditioning leadership. In essence, the predictors that emerged in this study are consistent with the notion outlined earlier that effective performance in leadership positions requires discretionary problem solving

Table 7. Blocked Regression Analysis Results in Male and Female Samples

		Male Weights <sup>a</sup>	Female Weights <sup>b</sup>
Block 1	Practical Intelligence	.28	.29
	Deductive Reasoning	.23	.26
	Inductive Reasoning	.45	.36
	Creativity	.20	.36
	Multiple R for block $R_{\Delta}^c =$	.41	.44
Block 2	Practical Intelligence	.21	.10
	Deductive Reasoning	-.07	.02
	Inductive Reasoning	.09	.07
	Creativity	.22	.29
	Energy	.57	.66
	Work Ethic	.47	.43
	Achievement Motivation	.53	.47
	Multiple R for block $R_{\Delta}^c =$	.67	.66
Block 3	Practical Intelligence	.11	-.01
	Deductive Reasoning	-.03	-.03
	Inductive Reasoning	.08	.07
	Creativity	.18	.17
	Energy	.18	.14
	Work Ethic	.17	.20
	Achievement Motivation	.33	.36
	Social Skills	.24	.39
	Persuasive/Dominance	.50	.53
	Institutional Adaptation	.20	.19
	Social Adjustment	.44	.50
	Multiple R for block $R_{\Delta}^c =$	.78	.79
Block 4	Practical Intelligence	.18	.02
	Deductive Reasoning	-.03	-.07
	Inductive Reasoning	.07	.04
	Creativity	.20	.18
	Energy	.11	.12
	Work Ethic	.14	.21
	Achievement Motivation	.37	.37
	Social Skills	.23	.37
	Persuasive/Dominance	.55	.53
	Institutional Adaptation	.12	.14
	Social Adjustment	.35	.42
	Independence	-.11	-.10
	Personal Adjustment	.18	.01
	Openness	-.07	.04
	Positive Temperament	.17	.03
	Self-Esteem	-.03	.31
	Multiple R for block $R_{\Delta}^c =$	.80	.80

**Table 7. Blocked Regression Analysis Results in Male and Female Samples  
(Continued)**

		Male Weights <sup>a</sup>	Female Weights <sup>b</sup>
Block 5	Practical Intelligence	.15	.03
	Deductive Reasoning	-.06	-.10
	Inductive Reasoning	.04	.02
	Creativity	.17	.18
	Energy	.09	.11
	Work Ethic	.05	.13
	Achievement Motivation	.35	.37
	Social Skills	.26	.42
	Persuasive/Dominance	.63	.50
	Institutional Adaptation	.06	.12
	Social Adjustment	.34	.42
	Independence	-.01	-.03
	Personal Adjustment	.16	.03
	Openness	.00	.05
	Positive Temperament	.13	.02
	Self-Esteem	.02	
	SES	-.09	-.09
	Parental Control	-.05	-.10
	Paternal Warmth	.02	-.06
	Parental Rewards	-.20	-.08
	Traditional Values	.13	.14
	Negative Parental Behavior	.02	-.02
	Role Modeling	-.04	.00
	Family Exposure	-.14	-.05
	Parental Conscientiousness	.19	
	Family Conflict	-.13	-.14
	Maternal Warmth	-.09	.03
	Nonparental Support	.24	.03
	Male Sex Role	-.01	.09
	Female Sex Role		.02
	Multiple R for block $R_v^c =$	.82	.81
	Cross-Validated Multiple R $R_{cv}^d =$	.72	.78

<sup>a</sup>Unstandardized regression weights obtained when block was first entered in male sample.

<sup>b</sup>Unstandardized regression weights obtained when block was first entered in female sample.

<sup>c</sup> $R_v$  designates validation sample multiple R for block.

<sup>d</sup> $R_{cv}$  designates cross-validation multiple R across all blocks.

in distinctly social contexts. These results also converge with earlier experimental studies. Kenny and Zaccaro (1983) and Zaccaro, Foti, and Kenny (1991) have shown that characteristics of the individual can account for a substantial portion, 40 to 80%, of the variance in leader emergence in experimental groups. The multiple Rs and cross-validated multiple Rs obtained in this study indicate that a substantial portion of the variance in "real-world" leadership activities, some 50 to 70%, can also be accounted for by characteristics of the individual. Taken together, then, the results of this study provide encouraging evidence for the leader characteristics proposed here.

A study completed by Connelly (1991) using this database (i.e., Owens & Schoenfeldt, 1979) provides support for some of the mediated linkages proposed in the leader KSAP model (see Figure 3). Specifically, Connelly used path analysis to assess the fit of a model having five exogenous variables. The first two of these variables, reasoning ability (which combined inductive and deductive reasoning) and creativity reflected the cognitive generating factors in the leader KSAP model. The remaining three variables, self-esteem, positive temperament, and achievement, were analogous to some of our proposed personality constructs and values (see Table 5). The mediators in Connelly's analysis were institutional adaptation, persuasion, and social skills or social abilities. These constructs are similar to our embedded appraisal skills. The results of the path analysis indicated that the influences of the five exogenous constructs on adolescent leadership were partially mediated by the three mediators. While some direct effects were uncovered, this can be attributed in part to variables not included in the tested model but proposed as part of the leader KSAP model (e.g., practical intelligence and problem-solving skills). In sum, these findings offer evidence of the mediating influence we have proposed for a leader's embedded appraisal skills in the prediction of leadership performance.

**Managerial Incidents Study:** A second validation study was conducted using the managerial performance scenarios generated for the test of the leadership taxonomy described earlier. To review, 26 critical incidents, representing a diverse set of problems confronted by mid to upper level managers were selected from reviews of the management case study literature. In the current study, each proposed KSAP was rated by four judges as to whether its possession would contribute to effective leadership performance in the problem scenario (1 = very little; 5 = very much). Table 8 presents the results of these ratings.

Several points regarding the proposed leader KSAPs and their interrelationships emerge from an analysis of these data. First, the inclusion of most of the KSAPs in this model were supported by the mean ratings. Across all 26 problem scenarios, 47 of the KSAPs had a mean rating higher than 2.5 (note that lower levels of social alienation and object belief are considered desirable for successful leadership; therefore, for this particular analysis, their ratings were reversed). Only 9 KSAPs had scores lower than 2. Also, the ranges of means indicate that 58 of the 65 KSAPs were considered of higher importance (i.e., highest mean rating at or above 3.00) in at least one problem scenario. A second observation is that generally the KSAPs linked most closely or directly to creativity and to practical problem solving skills were rated higher than other KSAPs. Indeed, the mean rating across the characteristics in the creativity core dimension was the highest (mean = 3.37) of all core dimensions; practical intelligence was the second highest (3.33). These findings support the conceptual basis for the proposed leader KSAPs, which was the definition of effective organizational leadership as creative problem-solving in ill-defined social domains.

A final observation is that the dimension with the lowest mean across characteristics (mean = 2.34) was social intelligence, which reflected primarily attributes related to personnel

**Table 8. Analysis of Managerial Critical Incidents: KSAPs**

Dimensions	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Cognitive Generating Factors</b>				
1. General Cognitive Intelligence				
A. Problem Anticipating	3.5769	.423	2.5000-4.0000	.0000-1.2910
B. Inductive Reasoning	3.1442	.340	2.2500-3.7500	.5000-1.7078
C. Deductive Reasoning	2.9615	.445	2.2500-3.7500	.5000-1.5000
D. Time Sharing	1.9519	.406	1.2500-2.7500	.5000-1.5000
2. Creativity				
A. Definition of Problem	3.5096	.403	2.7500-4.2500	.0000-1.2910
B. Fluency	3.5288	.540	2.5000-4.5000	.0000-1.4142
C. Originality	3.0673	.590	2.2500-4.0000	.0000-1.4142
3. Crystallized Cognitive Skills				
A. Oral Comprehension	2.4231	.314	2.0000-3.5000	.0000-1.2910
B. Written Comprehension	2.2596	.357	1.5000-3.0000	.5000-1.2910
C. Oral Expression	2.6111	.398	1.7500-3.2500	.5000-1.4142
D. Written Expression	2.2115	.372	1.5000-3.0000	.5000-1.5000
E. Information Ordering	1.7981	.361	1.2500-2.5000	.5000-1.0000
F. Selective Attention	1.6442	.355	1.0000-2.5000	.0000-1.0000
G. Technical Ability	2.9808	.644	1.7500-4.2500	.0000-1.1547

**Table 8. Analysis of Managerial Critical Incidents: KSAPs (Continued)**

Dimensions	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Personality</b>				
1. Adaptability/Ego Resiliency				
A. Adaptability	3.3750	.516	2.2500-4.2500	.5000-1.4142
B. Emotional Control	2.3558	.419	1.7500-3.2500	.5000-1.2910
C. Self-Esteem	3.2404	.466	2.5000-3.7500	.5000-1.2910
D. Risk Taking	3.1250	.690	2.0000-4.2500	.5000-1.2583
E. Performance Motivation	3.3365	.604	1.5000-4.2500	.5000-1.2583
F. Energy Level	2.5673	.472	1.7500-3.5000	.5000-1.4142
G. Sensing	2.5000	.292	2.0000-3.0000	.0000-1.9149
2. Openness/Curiosity				
A. Cognitive Complexity	3.3173	.328	2.5000-4.0000	.0000-1.7078
B. Openness to Experience	3.0577	.516	2.2500-4.0000	.5000-1.4142
C. Investigative	3.0577	.465	2.5000-4.2500	.0000-1.7078
D. Tolerance for Ambiguity	3.4423	.497	2.5000-4.2500	.5000-1.5000
E. Intuition	2.6058	.506	1.7500-3.5000	.0000-1.7078
F. Thinking	3.3462	.325	2.7500-4.0000	.5000-1.0000
G. Perception	2.0673	.422	1.5000-3.0000	.5000-1.5000
3. Self-Awareness				
A. Internal Locus of Control	2.7500	.406	2.0000-3.5000	.5000-1.7321
B. Self-Appraisal	2.7788	.426	2.0000-3.5000	.5000-1.2910
C. Tolerance for Failure	3.0192	.418	2.0000-3.7500	.5000-1.6330
D. Discretion (Ego Control)	3.7212	.438	3.0000-4.7500	.0000-1.2910

**Table 8. Analysis of Managerial Critical Incidents: KSAPs (Continued)**

Dimensions	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Values and Motives</b>				
1. Achievement				
A. Achievement	3.4904	.545	2.0000-4.2500	.0000-1.7078
B. Self-Expression	2.2019	.640	1.2500-3.5000	.5000-1.7078
C. Mastery Motives	3.0673	.532	1.5000-4.2500	.5000-1.2910
D. Autonomy	2.6058	.571	1.5000-3.5000	.5000-1.7078
2. Need for Dominance				
A. Need for Power	2.5385	.467	1.2500-3.5000	.5000-1.9149
B. Political	2.2885	.488	1.5000-3.5000	.5000-1.5000
C. Judgment	2.1058	.431	1.2500-3.0000	.5000-1.9149
D. Enterprising	3.3462	.765	2.0000-4.5000	.5000-1.5000
3. Commitment to Social Systems				
A. Responsibility	2.7788	.420	2.0000-3.5000	.0000-1.6330
B. Social	2.0673	.646	1.2500-3.2500	.5000-1.4142
C. Social Alienation (-)	1.2404	.193	1.0000-1.7500	.0000-.5774
D. Object Belief (-)	1.5192	.244	1.0000-2.0000	.0000-.9574
E. Coaching	1.8654	.575	1.0000-3.0000	.0000-1.7321



**Table 8. Analysis of Managerial Critical Incidents: KSAPs (Continued)**

Dimensions	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Embedded Appraisal and Implementation Skills</b>				
1. Practical Intelligence				
A. Monitoring Goal-Relevant Cues	3.3654	.476	2.2500-4.0000	.5000-1.7321
B. Selection of Solution Components	3.3883	.443	2.5000-4.0000	.5000-1.8257
C. Information Appraisal	3.2115	.344	2.5000-3.7500	.5000-1.2910
D. Information Gathering and Encoding	3.4519	.524	2.2500-4.5000	.0000-1.2910
E. Planning and Implementation	3.8365	.505	2.2500-4.5000	.5000-1.2910
F. Evaluation of Discrepancy Importance	3.4519	.520	2.2500-4.5000	.5000-1.7078
G. Monitoring Implementation and Solution Outcomes	3.1635	.596	2.0000-4.2500	.0000-1.8930
H. Problem Sensitivity	3.7212	.376	3.0000-4.2500	.0000-1.4142
I. Prioritizing	2.9327	.467	2.5000-3.7500	.5000-1.7078
J. Implementation of Solution	3.0962	.413	2.2500-4.0000	.0000-1.5000
K. Administrative Skill	3.0288	.512	2.2500-4.0000	.5000-1.5000
2. Social Intelligence				
A. Interpersonal Sensitivity	2.8462	.718	1.5000-4.2500	.0000-1.7078
B. Social Confidence	1.7019	.187	1.2500-2.0000	.5000-1.1547
C. Empathy	1.7212	.402	1.0000-2.5000	.0000-1.5000
D. Wisdom	3.1538	.469	2.5000-4.0000	.0000-1.5000
E. Feeling	1.7212	.303	1.2500-2.5000	.0000-1.5000
F. Negotiation Skills	3.4231	.595	2.5000-4.7500	.0000-1.5000
G. Social Adroitness	3.3750	.580	2.2500-4.5000	.5000-1.5000
H. Adherence to Procedures	1.6923	.460	1.2500-2.7500	.0000-1.2910
I. Norm Sensitivity (Social Conformity)	1.3942	.161	1.2500-1.7500	.5000-.9574

management in the implementation of problem solutions. Given that most of the problem scenarios in this set described incidents confronting mid to high level executives, this latter finding is not surprising. Direct personnel management and solution management are more often functions of lower level managers and executives (this argument will be discussed further in a later section of this report). Indeed, three social intelligence characteristics that are more likely to be related to the performance of high level executives, wisdom, negotiation skills, and social adroitness, had the highest mean ratings across the social intelligence skills (means of 3.13, 3.42, and 3.38, respectively).

Taken together, these data provide evidence for the validity of the overall KSAP model. We note that not all mean ratings for the proposed KSAPs were high. However, a critical point to remember is that no single or even small group of differential characteristics should be considered necessary and sufficient for organizational leadership. Rather, effective leadership will require a broad range of individual qualities that assume more or less criticality in different classes of performance situations. Thus, when summing across a range of leadership problems, moderate ratings should be expected. Indeed, the data on the range of means for each scenario indicate that almost all of the KSAPs were considered critical for success in at least one problem setting. Another critical point is that several KSAPs act primarily to condition the effective application of creativity and problem-solving skills; thus, their influences on discrete leadership actions is less direct. Of more importance are those skills that directly influence the quality and originality of problem solutions. Accordingly, these characteristics in the model yielded higher ratings. Thus, as a whole, these findings offer encouraging support for the proposed model. An important issue, then, becomes the effective development of these KSAPs.

### **Developing Leadership Capacity**

Knowledges, skills, abilities, and personality characteristics (KSAPs) have traditionally been viewed as stable, enduring properties of the individual (Tyler, 1965). More recent work, however, suggests that KSAPs should not be viewed as fixed attributes expressed in a consistent fashion (Fleishman & Mumford, 1989; Schooler, 1984; Wagner & Sternberg, 1985). Instead, these capacities and their effective expression develop over time as a function of exposure to and interaction with various situations. In the ensuing discussion, we will address certain issues bearing on the development and application of leaders' KSAPs over the course of their careers.

### **Developmental Principles**

**Models of Development:** A number of models for understanding development have been proposed. According to Overton and Reese (1973) and Reese and Overton (1970), these models fall into two categories: organismic and elementalist. Organismic models stress movement toward a final end state, where heredity and maturational variables lead to a series of progressive stage-like transformations in behavior. These models typically de-emphasize environmental influences, viewing them as factors that serve only to channel a predetermined pattern of growth and change. The theoretical models proposed by Freud (1940), Erickson (1957), Kohlberg (1968), and Piaget (1967) used this approach.

Elemental models, on the other hand, do not assume a fixed pattern of movement to an idealized end state. Theories based on the elemental approach instead stress the plasticity of development. They argue that the environment, through mechanisms such as learning and skill acquisition, has a marked impact on development. This approach is illustrated in Skinner's (1957) work on language acquisition and Pine's (1987) work on the ontogeny of self-concepts.

Each of the models has some value for understanding the development of certain forms of behavior. The organismic model, however, is not commonly applied in studies of adult development. This preference might be attributed to the decline of constant bio-social maturational influences after adolescence. More centrally, however, past learning and environmental opportunities appear to play a crucial role in adult development (Ables, Steer, & Wise, 1982).

These statements should not be taken to imply that theories of adult development hold to a strict elemental position. Current theories of adult development tend to be based on the notion of dynamic interactions between the person and the environment. These interactional models stress the point that both biological and historic properties of the individual interact with environmental demands in determining behavior and behavioral change. These dynamic interactions lead to a series of progressive changes in the individual, just as the individual's perceptions of, selections of, reactions to, and actions in the environment lead to progressive changes in the environment confronting the individual. Thus, to some extent, the individual creates the conditions for his or her own development.

A more detailed description of these interactional models of development may be obtained by consulting Lerner (1978), Lerner and Tubman (1989), Riegel (1975), and Tobach (1981). More centrally, longitudinal studies of adult development (Block, 1971; Caspi, 1987; Elder & Clipp, 1989; Magnusson, 1988; Mumford, Stokes, & Owens, 1990; Vaillant & McArthur, 1972) have provided substantial support for the tenets of this model. In addition, recent theoretical work by Buss (1989), Bandura (1986, 1989), and Kenrick and Funder (1988), emphasizing people's active construction of environments, their systematic actions on and reactions to environmental events, and overt selection of alternative situations, has lent further support to this model for understanding adult development. Thus, this interactional model will guide our discussion of the development of leadership capacity, focusing on the ecology model proposed by Mumford, Stokes, and Owens (1990).

**Ecology Model:** Within this model, development is held to be driven by the individual's search for situations contributing to his/her adaptation (Tobach, 1981). Thus, people perceive, enter, and act in situations in a fashion that contributes to feelings of subjective well-being (Higgins, 1987; James & James, 1984). The situations they are exposed to, however, change over time as a result of environmental instabilities and the individual's own actions. People, as a result, are required to cope with change throughout the life span, and this change and people's coping actions serve to spur adult development.

In the course of their development, people are exposed to a number of situations where many different kinds of actions are possible. Thus, different choices may lead individuals to develop differently. These choices, however, have been found to give rise to coherent, apparently self-propagating patterns of differential development (Block, 1971; Owens & Schoenfeldt, 1979; Schoenfeldt, 1974; Wesley, 1989). One theoretical system for understanding the emergence of these coherent, self-propagating patterns of differential development may be found in the ecology model (Mumford & Owens, 1984; Mumford & Stokes, in press; Mumford, Stokes, & Owens, 1990; Mumford, Uhlman, & Kilcullen, in press; Mumford, Wesley, & Shaffer, 1987; Stokes, Mumford, & Owens, 1989).

The ecology model focuses on differential development in adulthood. It is based on the assumption that people's time and energy are limited. Thus, people must select situations and potential actions in these situations in such a way as to maximize long-term adaptation.

Individuals are held to select situations based on their associated affordances or beliefs about the personal desirability of perceived situational outcomes (Baron & Boudreau, 1987; Gibson, 1979). Once people have entered a situation, however, they are held to become more knowledgeable about and sensitive to the affordance-laden implications of a situation, while simultaneously developing those characteristics, or resources, contributing to affordance attainment through the outcomes of their actions. Of course, given satisfying outcomes, prior development of knowledge and requisite personal resources should lead individuals to select similar situations in the future. Over time, this process of choice, development, and choice should lead to the emergence of a highly refined set of characteristics for the identification and exploitation of a certain class of situations.

Because no single type of situation is likely to satisfy all of a person's needs, people must select multiple situations and different kinds of actions in these situations. As a result, their choices will tend to be complementary and compensatory, rather than competing. When this individual structure is coupled with society's explicit selective acts and the structured nature of the social environment (Ables, Steel, & Wise, 1982; Caspi, Bem, & Elder, 1989), it will tend to give rise to coherent patterns of differential development.

Even over relatively short periods of time, however, people may be presented with a number of potentially significant choices. At first glance, it may not be clear exactly how people make a number of consistent decisions, often in novel situations, without extended conscious processing. A potential solution to this problem has been proposed by Mumford, Snell, and Reiter-Palmon (in press). Drawing from the literature on planning, decision making, and self-schema in narrative biographies, they argued that people do not evaluate each affordance and alternative action sequence. Rather, these features of the situation are evaluated vis-a-vis their fit to an opportunistic planning template (Hayes-Roth & Hayes-Roth, 1979; Krietler & Krietler, 1987). This template is held to reflect an idealized image of life or a projected image about how life should come out that reflects an integration of needs, values, beliefs about oneself, and beliefs about the world. Further, this template is held to be subject to systematic refinement, although its application may be virtually automatic following crystallization or movement into an appropriate and integrated role set (Mumford, Wesley, & Shaffer, 1987).

The fit of situations to this template is held to give rise to meaning-driven affect. This affect, in conjunction with embedded appraisal skills, is held to condition situational evaluation and selection. Embedded appraisal capacities, including knowledge of affordances, knowledge of action potentials, problem construction skills, information acquisition skills, and solution monitoring skills, also influence action selection. In addition to these embedded appraisal skills, it is assumed that certain general, cross-situational, adaptive capacities, such as intelligence, mastery motives, self-esteem, organization, and achievement motivation, will be developing as a result of interchange in multiple situations (Fleishman & Mumford, 1989a). These attributes will influence the nature, ontogeny, and application of the embedded appraisal skills and the discrete KSAPs required for effective performance in a given situation. Finally, it is assumed that these attributes, in conjunction with knowledge of the outcomes resulting from situation exposure, especially negative outcomes (Tyler, 1965), will lead to the emergence of specialized evaluative standards.

Figure 4 presents a schematic overview of the relationships among these different kinds of functions in conditioning differential development in a certain class of target situations. Although this model is complex and indicates ongoing reciprocal relationships among many of these attribute categories, it does have some important implications for understanding

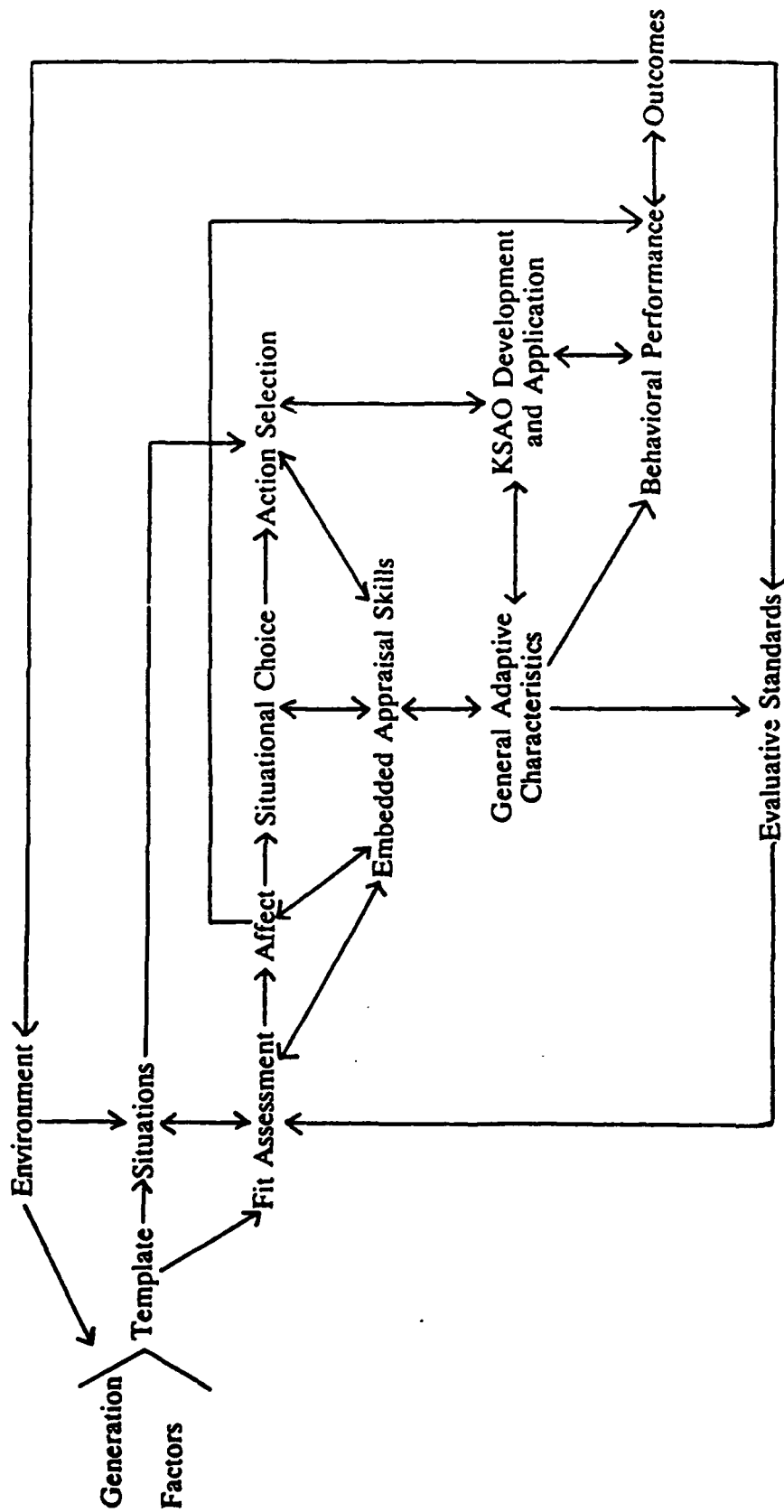


Figure 4. The Ecology Model

differential development in adulthood. We will, in the ensuing discussion, examine some of the model's implications for understanding this development.

**Stability and Adaptation:** One important implication of this model pertains to the stability of differential characteristics in adulthood. In accordance with the observations of Holland (1973), Pulkkinen (1982), and Schaie and Geitwitz (1982), this model suggests that people select situations and actions consistent with the pattern of differential characteristics developed through prior situational exposure. This self-reinforcing action pattern should, in turn, engender some stability in adults' differential characteristics, especially when coupled with the structural interdependencies among situational exposures, the individual's tendency to seek out congruent situations, and social and personal pressures to maintain consistency in one's self-image (Abels, Steel, & Wise, 1982; Caspi, 1987; Caspi, Bem, & Elder, 1989).

In fact, longitudinal studies by Costa and McCrae (1976, 1978, 1980) and McCrae and Costa (1990) indicate that broad personality characteristics, such as extraversion, neuroticism, openness, agreeableness, and responsibility, evidence substantial stability throughout adulthood. Other work by Campbell, Borgen, Eastes, Johansson, & Peterson (1968), Campbell (1973), Rokeach (1973), and Mumford, Snell, and Hein (in press) has provided evidence for the stability of motive patterns and more discrete situational preferences. Similarly, Owens (1953), Schaie and Hertzog (1986), and Terman and Oden (1959) have shown that intellectual abilities also evidence substantial stability during adulthood.

Not only does this model explain the aggregate stability of differential characteristics, it also points to the kind of characteristics likely to have a marked impact on long-term developmental outcomes. General adaptive characteristics focusing on problem-solving capacities, such as intelligence, condition the development and application of embedded appraisal skills, thereby contributing to effective situational choice and action (Carrol & Gillen, 1987; Friedman, Scholnick, & Cocking, 1987). Furthermore, these cognitive capacities also contribute to the development of the discrete KSAPs required for effective performance in a given situation (Murphy, 1989). Thus, one might expect these cognitive capacities to exert a strong effect on broader life outcomes. The broad, long-term impact of cognitive capacity on life outcomes has been demonstrated in a number of developmental studies (Sears, 1977; Stamp, 1988; Terman & Oden, 1959).

As noted earlier, intelligence and other broad, cognitive abilities are not the only kind of general adaptive characteristics. Certain personality and motivational attributes, including self-esteem (Bandura, 1986, 1989), mastery motives (Dweck, 1986), self-awareness (Brandstater, 1989), and openness (McCrae, 1987), can also influence the development of appraisal skills and performance capacities. These characteristics may also condition entry into and performance in the new situations that spur developmental change. Thus, it is not surprising that studies by Caspi (1987) and Caspi, Bem, and Elder (1989) have shown that attributes of this sort can also have a marked impact on the long-term outcomes associated with differential development in adulthood. Bray, Campbell, and Grant's (1974) study of managerial lives suggests, furthermore, that these effects hold even when individuals have been equated on initial performance skills. Thus, certain general personality and motivational attributes may be of great importance in understanding differential development in adulthood.

**Change:** Although many mechanisms conspire to induce substantial stability in adults' differential characteristics, change can occur. In a recent analysis of autobiographical data, Handel (1987) marshalled evidence indicating that chance exposure to novel, unanticipated

situations played an important role in shaping people's lives. Furthermore, these chance events tended to stand out in people's minds as truly crucial developmental experiences. Howe (1982) reached a similar conclusion in his study of how unanticipated life events, such as illness, shaped the lives of highly creative individuals.

Because the outcome of these new situational exposures can exert cumulative changes in embedded appraisal skills, adaptive characteristics, and specific performance capacities, thereby influencing later choices, it is not surprising that these events can have far-reaching developmental implications. This point has been illustrated in a study by Elder and Clipp (1989). They found that exposure to intense combat situations in World War II led to initial behavioral and emotional problems. As these initial stress effects diminished, however, these experiences contributed to greater long-term resilience and coping skills. Similarly, Russell and Domm (1990) have shown that demanding supervisors and difficult job experiences contribute to long-term career growth. Thus, there is reason to believe that unexpected exposure to difficult, demanding, new situations contributes to differential development. These situations may induce some stress, but, more importantly, their associated adaptive demands seem to spur development, especially when prior preparation and social support serves to minimize the debilitating effects of stress (Headey & Wearing, 1989; Hotard, McFatter, McWinter, & Sitadale, 1989; Kahn & Artturnuci, 1980).

The impact of exposure to new and demanding situations is of interest for another reason. McCrae's (1987) and MacKinnon's (1962) work suggests that individuals possessing certain characteristics, such as openness, tolerance for ambiguity, cognitive complexity, achievement motivation, curiosity, and self-esteem, are more likely to enter and be exposed to new situations. If these characteristics are combined with attributes, such as intelligence, self-awareness, and resistance to stress, that permit individuals to profit from these situational exposures, they may make an important contribution to differential development and spur effective developmental change.

The growth and change implied by exposure to new situations may not always derive from unanticipated demanding events. According to Havinghurst (1953), society and social organization impose time-bound or age-graded normative expectations on individuals concerning behavior in certain situations. These normative expectations are related to social roles and often occur in integrated sets associated with role demands (Erikson, 1959). Because these socially-defined developmental tasks change over time, they may also serve to spur differential development as individuals attempt to adapt to the associated performance requirements.

These age- or career-graded changes in social role expectations have been viewed as an important, if not crucial, determinant of adult development (Erikson, 1957). These role changes, however, do not typically induce the kind of difficulties suggested by certain colloquial writings on mid-life crises (McCrae & Costa, 1990). One reason individuals appear to cope with these transitions is that society and social organizations systematically prepare people for these transitions (Erikson, 1971). Another reason people cope with these transitions is that they systematically seek out situations that allow them to apply KSAPs developed earlier (Pulkkinen, 1982). Finally, people are aware of these changes in role expectations and typically engage in proactive behaviors intended to bring about desired changes and facilitate their adaptation to these new situations.

One illustration of how these role expectations influence adult development has been provided by Howard and Bray (1988). In their longitudinal study of managerial lives, it was

found that experience and changes in role expectations led to increases in the application of cognitive capacities, higher administrative skills, and greater work involvement. On the other hand, the demands of sequential changes in managerial roles led to declines in motivation for advancement and certain interpersonal social concerns. These aggregate changes, however, interacted with extant differential characteristics such that individuals who possessed higher cognitive capacity and better temperaments tended to gain more from exposure to new situations and progress more rapidly through management. Thus, normative expectations may spur both aggregate changes and changes in differential characteristics at the individual level.

A third source of developmental change may be found in certain historic forces leading to shifts in the nature and structure of situational exposures. Traditionally, developmental psychologists have discussed these historic forces under the broad rubric of cohort effects. Cohort effects represent an amalgam of many kinds of broader historic social changes that might influence the course of individual development, including (a) changes in the characteristics of individuals examined as a result of their developmental experiences; (b) society's explicit selective acts that lead to changes in the characteristics of the individuals being studied; (c) the emergence of new developmental situations; (d) changes in the interrelationships among developmentally significant situations; and (e) changes in the rewards, punishments, and perceived affordances associated with various actions in different situations. Numerous longitudinal studies have demonstrated the impact of these historic social forces on differential development (Elder, 1974; Owens, 1953; Schaie, 1984). Furthermore, numerous techniques have been devised for disentangling aggregate social influences of this sort from changes occurring at the individual level. As alluded to above, however, these techniques need to take into account not only aggregate shifts in environmental demands, but also their interaction with various differential characteristics (Caspi, 1987).

**Maladaptation:** Our discussion of the forces engendering adaptation, growth, and change in adulthood implicitly pose an important, often overlooked, question. One might ask, more specifically, how does an adaptive system give rise to the difficulties people often encounter in the course of their lives? To address this question, it is important to recognize that people only seek adaptation; their efforts do not ensure adaptation. Thus, this model permits a number of forces to operate that might give rise to maladaptation.

One way maladaptation might occur is through the failure of individuals to display sufficient general adaptive capacities, thereby prohibiting development of the discrete KSAPs required for effective performance in situations thrust on the individual. This type of maladaptation may become particularly salient when graded social expectations are associated with increased demands. Alternatively, people's prior development may have failed to provide them with requisite levels of certain requisite characteristics or may have left them with characteristics that actively conflict with the adaptive demands made by a new situation. Alternatively, people's embedded appraisal skills may be poor, leading to an inadequate understanding of situational affordances and the actions required for effective action in a given situation. This effect, of course, will be accentuated by self-appraisal biases, such as the tendency to seek out confirmatory information.

In addition to these broad, rather general forces contributing to maladaptation, a number of somewhat more subtle influences might influence people's development. For instance, the template or story being applied by an individual might have been constructed under unrealistic conditions or be inappropriate with respect to maintenance of the social system. In both cases, the resulting goals, perceptions, and affect might lead to negative consequences. Alternatively,



certain characteristics or early negative experiences may lead individuals to avoid situations required for long-term adaptation. A case in point may be found in inadequate delay of gratification (Livson & Peskin, 1972) or in Caspi's (1987) discussion of emotional volatility. A final mechanism that might diminish long-term adaptation is functional fixedness derived from overspecialization resulting in a lack of flexibility.

It should also be recognized that some degree of stress and conflict may be endemic to development. Although individuals prepare themselves for shifts in normative role expectations, these shifts in situational exposures may have unintended consequences. For instance, the characteristics developed to cope with earlier situations may interfere with performance or the development of performance-relevant KSAPs required in later situations. The resulting conflict between affordance preferences and action strategies may result in substantial stress. One illustration of this principle may be found in Dweck's (1986) work on the transition from performance goals to mastery goals. The existence of these conflicts, of course, suggests that mapping of the KSAPs required for performance at different phases in a graded role set may do much to enhance our understanding of development by marking these conflicts and suggesting requisite interventions intended to minimize stress and maladaptation.

### **Leadership Development**

As indicated in the foregoing discussion, leadership development represents a specific case of adult development; thus, a systematic application of developmental principles should do much to facilitate leadership development. However, because of the peculiar nature of organizational leadership, certain specific characteristics of leadership roles and role progression must also be considered in constructing a theoretical model for leadership development.

### **Leadership Roles**

Earlier we argued that organizational leadership positions require problem solving in an ill-defined and variable social domain. When one examines the characteristics of progressive changes in leadership role expectations with this point in mind, certain essential features of the developmental situation confronting embryonic leaders become apparent. In the ensuing discussion, we will attempt to outline these features.

To begin, this view of leader performance suggests that any leadership position entails discretionary problem solving. Jaques (1977) and Jacobs and Jaques (1989), however, have accrued a variety of evidence indicating that as individuals progress through a sequence of leadership roles, the degree of individual discretion increases along with the time span to receipt of feedback. Essentially, this is an argument which suggests that the breadth, complexity, and abstractness of leadership problems increases as one moves through a role sequence. Prior research by Gettinger and White (1979), Mumford, Weeks, Harding, and Fleishman (1987, 1988), and Snow and Yallow (1982) indicates that these same factors lead to progressive increases in learning difficulties while making progressively stronger demands for abstract problem-solving skills.

The definition of leadership proposed earlier and the nature of organizational systems imply a second characteristic of leadership roles. In any leadership position, the leader will be presented with an ill-defined problem (Gettys & Fisher, 1979; Gettys, Pliske, Manning, & Casey, 1987; Meehle, 1982). As individuals ascend the organizational hierarchy, the number of subsystems impinging on problem solutions increases, while buffering from the external

environment decreases. As a consequence, problems become progressively more variable and ill-defined. This decrease in the clarity of problem-solving goals and required procedural and declarative information implies that substantially more attention must be given to acquiring information, appraising information, constructing and defining significant problems, and evaluating progress towards problem resolution. In essence, this is to say that complex appraisal skills and complex meta-cognitive capacities become more important to successful performance as one progresses upward in an organization.

As individuals progress through organizational leadership positions, they are also expected to interact with multiple other systems under conditions where the environment is changing and buffering is low. Furthermore, they are expected to deal with these changing, often novel conditions in such a way that they initiate, generate, and create a structure within which lower-level units can get work done. The need to create structure and plans when coupled with the ill-defined nature of the problem domain indicates that the degree of creativity required will increase as individuals progress through leadership roles (Mumford & Connelly, in press; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Thus, combination and reorganization, problem definition, and category search become more important, along with knowledge and understanding of multiple subsystems and the broader environment. In line with this proposition, Bray, Campbell, and Grant (1974) have found that breadth of interests is related to management progress.

In any leadership position, success is contingent on the effective implementation of problem solutions (Mumford, 1986). This fact, when coupled with our proceeding observations, places high-level organizational leaders in a precarious position: One which leads to another structural change in the nature of leadership positions. Mumford and Gustafson (1988) note that the implementation of novel, untried problem solutions often requires substantial self-esteem, a willingness to take risks, and substantial persuasive or interpersonal influence skills. Additionally, Gardner (1988) points out that motivation for such effort often requires commitment to a vision and, thus, a story of the self which, in the case of leaders, is consistent with organizational needs and the requirements for system growth and maintenance. Hence, congruence of the self-template and the organization, as well as the importance of a strong, coherent vision in service of the organization, may become more important as individuals progress through their careers.

The final change implied by the structure of leader roles bears on the distinctly social nature of leadership problems. All leadership problems emerge in a context which includes an important social component. At lower levels of an organization, this social contact is typically of an immediate interpersonal nature, where divisions of authority are clear-cut and power relationships well-defined. Upper-level roles in organizations, however, present more abstract social information and require more collegial interactions with nominal subordinates who themselves possess substantial power over peers responsible for other large systems. As a result, social interaction changes in its fundamental nature by becoming more abstract in one sense but closer, more informal, and simultaneously more interdependent in another sense.

Taking stock in these progressive role changes, four general points come to fore. First, leadership roles induce a social career grading with respect to abstract problem-solving requirements. Second, these problems shift from concrete reasoning to complex, creative or integrative problem solving involving diverse knowledge, active structuring, combination and reorganization, vision, and balanced risk taking. Third, social skills and the forms of interaction

and influence change. Fourth, and finally, these changes bring about progressive shifts in the differential characteristics required for effective performance.

These observations have a number of salient implications for understanding leadership development. First, due to high learning difficulty, individuals must be prepared for progressively more advanced leadership positions. Second, because intelligence and other related cognitive capacities increase the power of individuals to grasp conceptual aspects of situations, they are likely to become progressively more important as one ascends through a set of leadership roles. This is in part because of the increased breadth and complexity of the problems presented, and in part because of the increased difficulty of the material that must be mastered to solve these problems. Third, breadth, complexity, and the need for rapid acquisition of progressively more difficult material for use in problem solving implies that capacities that allow individuals to acquire and apply complex information are likely to become progressively more important to performance at higher levels of the organization. Based on the observations of Degroot (1966) and Chi, Gleser, and Rees (1982), this observation suggests that leaders will require more complex, better organized knowledge systems capturing well-defined principles and key diagnostics, and that attributes, such as intelligence, cognitive complexity, problem construction, and intuition, may become progressively more important determinants of performance as individuals move through their careers.

### **Career Progression**

The progressive changes in leader roles as described above define the developmental tasks confronting leaders. These changes in developmental tasks, however, are explicitly linked to the fundamental nature of organizational systems. By looking at the tasks confronting individuals at different points in an organizational system, it therefore becomes possible to construct a more explicit model of career development.

In the broadest sense, the organization represents a macro socio-technical system interacting with other systems that compose the broader society within which the fundamental goals and nature of the organization must be defined. Further, its structures for meeting these objectives must be created in a variable social context. A military example of such organizations or systems would be a corps, or any larger embedding system. The organization is composed of a set of operational subsystems, or functional and social arrangements that are responsible for many more specific objectives and functions related to organizational goals. Army divisions exemplify organizational subsystems. These subsystems contain a number of multiunits, which comprise an arrangement of individuals and equipment tasked with meeting key (and more narrow) functional objectives related to a given subsystem's goals and purposes. An example in the Army of a multiunit would be a brigade. A central problem facing multiunit groups is the marshalling and operational direction of even more specific functional groups. Thus, the lowest order of functional subsystems are units, which are concerned with the completion of specific tasks and operations linked to subsystem objectives. Companies with the Army constitute examples of such functional units.

For reasons that will become apparent as we proceed, career development begins with unit leadership and progresses to leadership of the system as a whole. Table 9 presents an overview of this structural framework. In the ensuing discussion, we will attempt to draw out the implications of this task structure for leadership development, taking into account the developmental principles described earlier.

**Table 9. Leadership Career Roles in a Progressive System**

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<b>System Leaders</b>	
System Director	Integration of system and direction of future operations.
System Staff	Creation of system objectives and structure.
<b>Subsystem Leaders</b>	
Subsystem Leader	Direction of subsystem activities.
Subsystem Executive Officer/Lieutenant	Solution of subsystem operating problems.
Subsystem Staff	Analysis of subsystem operations and objectives.
<b>Multiunit Leaders</b>	
Multiunit Leader	Directing and structuring multiunit activities.
Multiunit Executive Officer/Lieutenant	Solving multiunit problems.
Operational Staff	Analysis of multiunit operations.
<b>Unit Leaders</b>	
<b>Developmental Issues</b>	
Core Unit Leader	Directing unit and specifying or controlling unit problems.
Executive Officer/Lieutenant	Solving unit operational problems.
Embryonic	Basic understanding of operations at unit level.

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**Unit Leadership Roles:** Individuals assuming leadership roles should possess a template or self-image that is congruent with organizational demands and possess the general adaptive characteristics that make it possible to solve pertinent leadership problems. As suggested by Howard and Bray's (1988) findings that the rich get richer, in the sense that leaders possessing these desirable characteristics develop more rapidly, it would seem preferable to select leaders based on characteristics such as intelligence, self-esteem, and achievement motivation. However, simple possession of these characteristics does not ensure effective, discretionary problem solving as it applies to organizational leadership problems. The reason for this state of affairs is three-fold. First, embryonic leaders lack the embedded appraisal skills and knowledge that will allow them to understand leadership situations and identify appropriate actions in these situations. Second, they will lack an understanding of how general adaptive capacities should be applied to various leadership problems. Third, they will not have had many opportunities to develop the specific KSAPs required for effective performance in discrete leadership positions.

These observations indicate that inexperienced leaders present a complex developmental problem that cannot be solved in a day. Instead, developmental efforts must be initiated that provide these embryonic leaders with a basic understanding of the organization and organizational leadership problems while, at the same time, building a framework for further development. Thus, initial training is called for, typically in a formal classroom setting, that familiarizes the embryonic leader with the nature of the job and the people and materials that will be involved in solving unit-level problems. Classroom and basic field training, however, will not suffice because embryonic leaders lack the requisite embedded appraisal skills. Although certain kinds of cognitive training strategies might facilitate the development of practical and social intelligence (Mumford, 1986), initial development of these capacities is likely to require on-the-job experience, during which individuals are asked to solve structured, relatively concrete, unit-level leadership problems under conditions where more experienced personnel can provide adequate modeling and feedback. While this developmental strategy suggests that training and initial job experiences should emphasize the application of general adaptive characteristics to concrete unit-level leadership problems, it would be desirable for these initial experiences to instill mastery motives, self-esteem, emotional control, adaptability, empathy, and self-awareness, all of which might provide a basis for more effective learning while preparing individuals for their next major set of developmental experiences.

Earlier we noted that challenging initial experiences seem to facilitate later performance and development. Thus, after individuals have begun to generate a set of basic embedded appraisal skills and acquired some basic understanding of people, the technology, and unit operations, they should be given greater responsibility for solving unit-level problems. This might occur in an executive officer or lieutenant position, vis-a-vis unit leaders, where the individual is asked to troubleshoot unit-level problems. Because many of these are likely to involve people and their personal or professional problems, social skills, such as empathy and coaching, may prove of particular significance. Problem sensitivity, monitoring and assessment of goal-relevant cues, and implementation monitoring might all also prove of substantial importance in this kind of role.

This kind of unit executive/lieutenant role will serve, in part, to provide potential leaders with new, embedded appraisal skills and system capacities required of core unit commanders. Unit commanders will typically be responsible for structuring group activities and maintaining group members such that specific, given objectives can be achieved. Thus, social skills, such as empathy and coaching, are likely to remain significant influences on performance, as are attributes, such as problem sensitivity, implementation monitoring, and monitoring and

assessment of goal-relevant cues. At this juncture, however, the directive unit management responsibilities are likely to begin to place a greater emphasis on classic managerial and administrative capacities, such as prioritizing, planning and implementation, responsibility, organization, practicality, administrative skills, time sharing, written expression, need for power, and autonomy.

**Multiunit Leadership Roles:** Unlike single units that employ a certain technology to meet discrete objectives, multiunit organizations combine multiple technologies and functions to meet broader, more complex objectives. Leadership roles at this level involve coordinating or integrating the activities of core units to achieve these broader objectives. This coordination and integration of core units will not typically involve "hands-on" contact with core unit members. Thus, attributes such as empathy, coaching, and nurturance may diminish in importance, along with direct implementation and administration KSAPs, such as sensing, administrative skills, and solution implementation.

This major transition, however, is likely to place a far greater premium on more abstract problem-solving capacities that involve the integration and direction of multiple core units to different, but reasonably well-specified, objectives. One implication of this statement is that at this point in their careers, leaders must receive training that illustrates or provides knowledge about the functions of multiple units and their interrelationship. More broadly, however, the kind of leadership problems being presented at this level is likely to call for substantially greater reasoning. Additionally, increased complexity and variability may place a new premium on attributes such as the selection of solution components, discrepancy assessment, planning, problem sensitivity, and information gathering and encoding. Finally, because multiple, diverse units must be dealt with without the benefit of idiosyncratic credits and personal familiarity with core units, tolerance for ambiguity, social adroitness, political values, and interpersonal sensitivity may all become more significant determinants of leader performance.

Given the number of KSAPs impinging on leader activities, knowledge alone will not ensure fully effective performance. Instead, practical exercises and systematic feedback need to be included in training. Furthermore, it will often prove necessary to provide individuals with some experience in staff positions where they are asked to analyze, report on, and address multiunit problems before assuming responsibility for addressing these problems. Following this experience, the leader is likely to be better prepared to address operational multiunit problems. However, before taking responsibility for multiunit activities, the leader should again be placed in a position where he/she serves as an assistant or lieutenant to a multiunit leader (Graen & Schiemann, 1978). This experience should be devised so as to illustrate the application of these more complex social and practical intelligence skills in an applied context, where decisions are likely to be relatively speeded and adjustment in plans and risk-taking need to be anticipated. This practical implementation experience should, in turn, prepare the leader to accept responsibility for multiunit leadership.

Multiunit leadership will involve substantial responsibility, organization, risk-taking, and energy levels, as well as more complex social skills, such as interpersonal sensitivity and social adroitness. More centrally, inductive reasoning, problem sensitivity, fluency of ideas, self-appraisal, and discretion may become more important as core units are shifted, reorganized, and recombined to meet objectives. Thus, multiunit leadership may involve not only greater abstract cognitive capacity but the more flexible application of reasoning and principles to achieve objectives.

**Subsystem Leadership Roles:** Multiunit organizations exist to achieve broader functional objectives. At the subsystem level, however, problems concerned with the direction, enhancement, and maintenance of basic organizational functions are likely to emerge. Furthermore, these functions are likely to be broad in scope, cover a longer time span, and require leaders to address broader social and technological changes as part of their responsibilities. As a result, cognitive demands, especially those that involve more abstract application of basic cognitive skills such as problem construction, problem sensitivity, selection of solution components, information encoding, information acquisition, and deductive as well as inductive reasoning are likely to make more important contributions to performance.

More centrally, however, at the subsystem level, four changes are likely to occur that induce a truly marked change in the nature of the leader's problems. First, leaders at this level will begin to take responsibility for specifying the major objectives that guide core unit and multiunit groups. Thus, deductive reasoning, written comprehension, thinking, wisdom, discretion, investigation, and cognitive complexity are likely to become significant influences on performance. Second, because buffering from the external environment is likely to be diminished, characteristics such as adaptability, openness, flexibility, wisdom, and self-awareness may become more important. Third, the greater time span and more abstract nature of the work, as well as the need to guide subsystem enhancement, may begin to place some emphasis on basic creative capacities, such as problem finding, originality, fluency, and combination and reorganization. Fourth, responsibility for solving relatively long-term subsystem problems, where the individual may not receive personal rewards, implies that general achievement values and commitment to the system as a whole may begin to become particularly important determinants of performance.

Given the complex nature of the capacities relevant to the solution of subsystem problems, it is obvious that advanced training and development experiences are likely to be required. However, the more complex nature of the problems and the diversity of information required may limit the utility of lectures focusing on specific facts and procedures. Instead, more developmentally-based training programs illustrating the principles, strategies, and procedures that might be used to solve subsystem problems seem most appropriate. This training experience should illustrate the complex, relative nature of problem solutions and encourage a more open, creative approach to problem solving (Covington, 1987).

Following a period of training or education, new subsystem leaders or staff are likely to be asked to apply these skills in a relatively limited problem domain. One viable alternative for acquiring this experience is in the role of subsystem planning. In fact, previous experience in multiunit staff, executive officer/lieutenant, and leadership positions, along with the appropriate knowledge, experience, and capacities (e.g., information acquisition, adaptability, solution monitoring, and discrepancy evaluation) will have provided leaders with much of the background required to move into these roles. Once the individual has refined these skills in subsystem planning exercises, they will be capable of solving operational subsystem problems. At this point, movement into a subsystem executive officer position becomes possible, where the individual is likely to take responsibility for the direction of major components of the subsystem, especially those involving significant problems in long-term functioning.

Experience in this position will, in the course of time, prepare the individual for subsystem leadership roles. Subsystem leadership roles are, by virtue of their complexity, discretionary time span, and impact, likely to require greater responsibility, self-awareness, problem definition, and social sensitivity because subsystem leaders must represent the concerns

of their constituencies to the broader organization. At this level, political values, social adroitness, and negotiation skills all become progressively more important determinants of performance.

Experience as a subsystem staff member may also provide appropriate training for multiunit leadership. The activities and insights gained in the role of assistant to subsystem leaders can facilitate both the coordination efforts required at the multiunit level and the boundary functions in this leadership role. The coordinator and integration of core units by multiunit leaders requires considerable interaction with other multiunits in the system. Such activities also require interactions with key elements of subsystem and system leadership. Accordingly, knowledge and competencies gained in a subsystem staff position can prove invaluable in the accomplishment of these multiunit leadership functions. Similarly, experience in system staff activities also may serve as excellent training for subsystem leadership by providing exposure to system boundary dynamics and access to cross-subsystem planning activities. Such exposure would facilitate the establishment and implementation of subsystem objectives in line with the broader system's goals and power dynamics (Pfeffer, 1977, 1981). Thus, while system or subsystem planning is preparatory to the eventual assumption of leadership within these same aggregations, such activities can also serve as part of a recycling process where multiunit and subsystem leaders gain experience in broader organizational domains before assuming primary responsibility for more narrow system functions and objectives.

**System Leadership Roles:** The individual's experiences in subsystem leadership positions should prove of great significance, because they will prepare the individual for movement into system leadership roles. At the system level, leaders must define the fundamental nature and objectives of the system in such a way as to ensure that the organization can accrue requisite resources and is capable of responding to its basic objectives. As a result, system leadership roles will demand substantially more contact with the leaders of allied systems. Furthermore, leaders will be responsible for constructing a framework for subsystem actions within the context of a broader social environment subject to changing expectations.

One implication of these observations is that system leaders need a broader perspective which extends beyond the organization. Essentially, they need a sophisticated understanding of the socio-technical environment. This might be provided by appropriate developmental interventions focusing on problem solving that take into account characteristics such as openness, breadth of interests, tolerance for ambiguity, and self-esteem that may influence performance, along with attributes such as problem definition, problem anticipation, information gathering and the selection of solution components, and information representation. This information, however, must be used to forge a direction for the organization that will contribute to long-run performance. Creative thinking skills such as reasoning, originality, and combination and reorganization may, therefore, prove of great import, along with such solution evaluation capacities as evaluation of discrepancy importance and goal monitoring. Finally, because these solutions must be generated and implemented within the context of the broader social environment, characteristics such as social sensitivity, social adroitness, entrepreneurial values, and negotiating skills may also contribute to performance and should be attended to in attempts to develop system-level leadership capacities.

At this juncture, it might seem that we are describing a Nietzschean Übermensch. Leaders, however, are not superhuman. Thus, system leadership roles tend to be divided into two categories: system staff and system leaders. Typically, occupants of both roles will work in



a highly interdependent and collegial fashion. System staff, however, will focus on the generation of plans using their understanding of the operating environment and organizational subsystems. System leaders, on the other hand, are likely to focus more on evaluation of plans and problem definition. System leaders, furthermore, will be expected to take responsibility for these plans, while serving in a representational capacity which communicates the vision and objectives embodied in action plans to organizational members and other relevant subsystems.

The foregoing observations suggest that charisma and communication skills may be particularly important for system leaders (Bass, 1985). However, because system staff members and system leaders must make decisions in highly complex and ambiguous situations, it follows that their vision of themselves and their model of and commitment to the organization may also represent significant determinants of performance. Finally, this complexity and the need to generate solutions to nonroutine problems posed by a shifting organizational environment suggests that both groups are likely to manifest high intelligence and creative capacities (Mumford & Connelly, in press).

### **General Developmental Issues**

**Cognition and Problem Solving:** Unlike other models of career development (e.g., Schein, 1971), this model does not view development as proceeding through a set of invariant stages. Rather, in keeping with current theories of adult development (Lerner & Tubman, 1989), a series of progressive changes are envisioned that can be traced to the adaptive demands made by functional role requirements associated with the need for discretionary problem solving. However, full understanding of this model of leader development requires cognizance of a number of rather subtle implications that will be discussed in the following paragraphs.

To begin, it should be recognized that leaders are always required to solve discretionary problems in an ill-defined domain. What changes over time is not the absolute need for problem solving, but rather the increased complexity and abstractness of the relevant problems. Thus, characteristics such as inductive reasoning, deductive reasoning, and written comprehension are always likely to contribute to leader performance. The specific contribution of certain kinds of reasoning may change, however, such that deductive reasoning becomes more important at higher levels. Similarly, a degree of creative capacity will always be important in leadership; however, because higher level leaders generate structure, plans, and objectives in response to more unique problems, it becomes progressively more important at these levels.

**Developmental Facilitators/Inhibitors:** These changes in the nature of discretionary problem solving, however, have another significant implication. More specifically, leaders will constantly be developing and refining new embedded appraisal skills while acquiring the knowledge that provides a basis for any problem solution. Furthermore, across their careers, they will be developing new KSAPs that contribute to performance in discrete situations. Thus, general adaptive characteristics that serve to promote skill development, including attributes such as intelligence, problem sensitivity, self-esteem, openness, cognitive complexity, self-awareness, and mastery motives, are likely to prove of general long-term developmental significance.

Under conditions of change and development, the extent to which leaders possess these characteristics may prove to be an especially important determinant of long-term developmental outcomes. This suggests that organizations should search for leaders who possess these characteristics, as well as leaders who possess substantial cognitive capacity. Furthermore,

training or other developmental interventions should be designed so as to contribute to the development and more effective application of these characteristics.

These general adaptive skills and cognitive capacities are likely to become especially important determinants of performance in role transition phases. Role transition phases occur when the emerging leader moves from one major set of leadership roles to another (e.g., unit to multiunit). The significance of these role transitions is that increased adaptive processing demands may call for further selection. More centrally, however, these general adaptive capacities may play a crucial role in facilitating the new learning and skill acquisition associated with these role transitions. As a result, these attributes may play a particularly important role in career development at multiple points in leaders' careers.

**Appraisal Skills and Flexibility:** The significance of these general adaptive characteristics lies not only in their ability to promote learning and skill development, but also in their contribution to the development of embedded appraisal skills, including various aspects of practical and social intelligence. As noted earlier, the development of these capacities in the context of organizational problems constitutes one of the fundamental issues confronting organizations in their attempts to develop effective leaders. This statement is not at all surprising when it is recognized that people have little difficulty in acquiring discrete facts and principles (Bromage & Mayer, 1986; Schemeck & Grove, 1979). Instead, people have difficulty in acquiring general organizing principles for acquiring and applying system knowledge (Reif, 1987; Rist, 1989). Thus, the development of these capacities may provide an important basis for career development. This seems especially likely to be true, since the evidence compiled by Baer (1989), Brown and Campione (1986), Chi, Bassock, Lewis, Rieman, and Glaser (1989), Covington (1987), Hayes and Flower (1986), and Kanter (1987) indicates that appropriate educational interventions can contribute to the development and effective application of these capacities in "real-world" problem-solving efforts.

Because these embedded appraisal skills contribute to knowledge acquisition, situational choice, and action selection across a number of discrete situations, they have another significant implication for leadership development programs. They allow the individual to become progressively more adaptive and flexible. However, because these capacities develop slowly over time, moving from specific to general as individuals solve problems (Chi, Bassock, Lewis, Reiman, & Glaser, 1989), flexibility will increase substantially over time, allowing leaders to perform effectively in progressively more complex and varied situations.

**KSAPs and Changes Over Time:** When one reviews the foregoing discussion, it should become apparent that no single characteristic fully conditions performance in complex organizational leadership positions. Rather, an extensive set of characteristics contributes to leader performance and the development of performance capacity. Furthermore, due to changes in the problems confronted in different leadership roles, there may be shifts or changes over time in the impact of the characteristics on leadership performance.

This point is made graphically by the hypotheses presented in Table 14 in the next section, which summarizes much of the information presented in the foregoing discussion. More specifically, it lists the differential characteristics likely to contribute to leaders' discretionary problem-solving efforts and how these differential characteristics change as individuals move through the role sequence sketched out above. Additionally, it describes the characteristics that might act to facilitate or inhibit skill acquisition with progressive role changes.

**Environmental Influences:** Considering these hypotheses, it is important to bear in mind the assumptions underlying their derivation. For example, these hypotheses were formulated with respect to functional organizational roles, not age or experience. Further, these functional leadership roles cannot be directly related to rank and pay, although they are certainly correlated with age, experience, rank, and pay. This point may be seen by noting that unit commanders in the Army are likely to be young captains. However, Army colonels might be multiunit commanders, subsystem planners, or, occasionally, even system planners. It should also be recognized that these roles represent very broad, general attributes of all organizational systems. Within these general role categories individual leaders may be presented with rather different tasks. The environmental or situational differences in the specific kinds of tasks presented to leaders and the conditions under which they are to be performed may serve to moderate the impact of differential characteristics on leader performance. To identify the nature of these environmental moderators, a review of situational models of leadership was conducted. Also included in this analysis were studies that examined situational/environmental constraints on performance, of the leader or otherwise, particularly in military settings (e.g., Peters & O'Connor, 1980; Peters, O'Connor, Eulberg, & Watson, 1988). This literature review revealed a large set of variables reflecting influences ranging from those exerted by discrete, intraunit characteristics (e.g., subordinate ability, motivation, unit norms) to those stemming from more macro qualities of the organization as a whole (e.g., climate, structure) and of its external environment (Bass, 1990; Howell & Dorfman, 1981; Howell, Dorfman, & Kerr, 1986; Kerr & Jermier, 1978; Peters & O'Connor, 1980; Peters, O'Connor, & Rudolf, 1980; Schneider, 1978; Yukl, 1989). The work of Howell, et al. (1986; see also Howell & Dorfman, 1981; Kerr & Jermier, 1978) also indicated four general ways factors outside of the leader can influence or moderate the nature of leadership actions. First, such factors may act to neutralize leader actions, such that leader influence on system, subsystem, or unit goal attainment is rendered ineffective or impossible. One such factor is a complete lack of subordinate capability or motivation. A second environmental influence can be "leader substitution", where factors or events outside of the leader take the place of, or render unnecessary, actions by the leader. For example, when group cohesion facilitates unit coordination and planning, it can act as a leader substitute (Howell & Dorfman, 1981; Schriesheim, 1980). Other potential substitutes include organizational formalization and methodologically invariant jobs (Howell & Dorfman, 1981). A third influence is a supplementary one, in which environmental factors and events complement the effects of a leader's plans and actions. Howell, et al. (1986) cite task-based feedback to the subordinate as a leader supplement. A final environmental influence, perhaps the most desirable for leadership action, is an enhancer, where a situational factor augments or enhances the effects of leadership attempts. Howell, et al., (1986) cite as potential leadership enhancers high levels of subordinate experience and the leader's control of organizational resources and rewards.

Each of these environmental factors and events should be viewed as presenting either problems or opportunities for leaders exercising influence attempts (cf. Howell, et al., 1986). This is especially true of neutralizing events that need to be removed or resolved if the leader is to be effective. This suggests a proactive role for leaders rather than the reactive one that is often implied in the literature describing situational constraints on leadership. Indeed, gifted leaders may, for example, act to increase their effectiveness by developing elements of their environment (e.g., unit cohesion) that take over specific solution implementation functions in particular problem domains. Here, leader influence is no longer direct (and hence is "substituted for" by the environmental element), but rather indirect through long range planning activities. Also, leaders may develop environmental enhancers that increase the effectiveness of their influence attempts (cf. Jacobs & Jacques, 1987). Indeed, the leader behavior dimension of

developing personnel in the leadership taxonomy described earlier can be viewed as encompassing leadership enhancement activities. In essence, then environmental characteristics and situational constraints can to be considered in many instances as problems leaders need to solve to facilitate organizational goal attainment. Hopefully, the resolution of these events turns them into leader enhancers or planned leader substitutes.

From our review of the literature, we identified 94 factors outside of the military leader that may produce one of the four aforementioned moderating influences on influence attempts. These factors are listed in a questionnaire to be described later in this report (see Appendix E-4). Table 10 presents superordinate and subordinate categories that subsume these factors. The first superordinate category, nature of the Army, refers to factors that characterize the Army as a whole. These include factors related to organizational climate, organizational structure, and behavioral conventions within the Army. Examples of such environmental influences are Army attitudes towards failure, chain of command, and rigidity of standard operating procedures. The second category is the nature of the unit, which refers to such characteristics as unit composition, unit norms, and the nature of member affiliations within the unit. Factors in this category are heterogeneity among member abilities, high performance norms, and unit cohesion.

The third category of environmental influences refers to the nature of the soldier or subordinate. Specifically, this includes factors related to soldier KSAPs, soldier commitment, and soldier attitudes. Characteristics subsumed in this category are the expertise and experience of soldiers, value congruence between soldier and Army, and attitudes toward reward systems. The fourth and fifth categories refer to characteristics of the soldier's and leader's jobs and positions. For the soldier, important job factors include degree of structure, role clarity, and job-related values. For the leader, comparable factors include scope of responsibilities, external demands, and resource support. The nature of resources and resource availability define the sixth category in this classification. This includes condition of equipment, budget limitations, and technological characteristics. The final category refers to the physical, political and social aspects of the Army's environment. This category is also subdivided into non-combat and combat-related characteristics.

A key consideration for the utility of this classification system is that leaders occupying different organizational role levels will vary in the frequency and degree to which they encounter particular environmental influences. Accordingly, they will also vary in the attention and effort they expend relative to these events. Thus, core unit leaders may be required to deal more often with events and influences related to the natures of the unit, the soldiers, and the soldiers' jobs. Multiunit leaders may be also be concerned with the natures of resources, and of their positions. Finally, the nature of the Army and its environment may be of greater concern and demand to subsystem and system leaders. In essence, one may view leaders at different organizational levels as confronting problems and opportunities presented by very different organizational challenges. Indeed, the situational influences operative at a leader's level and above are likely to be more constraining than those influences that more commonly occur at lower levels. Further, individuals having high levels of the leader KSAPs proposed earlier should experience less difficulty in resolving situational constraints. Indeed, these leaders are more likely to turn such events into leader enhancers, that is opportunities for more (not less) effective leadership influence.

**Patterns and Types:** The existence of these situational moderators, when considered in light of the characteristics that might contribute to leader performance, points to another aspect of this developmental approach. Earlier, we noted that adult development is conditioned not

**Table 10. Taxonomy of Environmental Moderators**

**A. NATURE OF THE ARMY**

1. Organizational Climate
2. Organizational Structure
3. Organizational Convention

**B. NATURE OF THE UNIT**

1. Unit Composition
2. Unit Norms
3. Unit Affiliations

**C. NATURE OF THE SOLDIERS**

1. Qualities of the Soldiers
2. Commitment of the Soldiers
3. Attitudes of the Soldiers

**D. NATURE OF THE JOB PERFORMED BY THE SOLDIER**

1. Structure
2. Understanding
3. Value/Importance

**E. NATURE OF THE LEADER'S POSITION**

1. Breadth of Command
2. External Demands
3. External Support

**F. NATURE OF THE RESOURCES**

1. Availability of Resources
2. Properties of Resources

**G. NATURE OF THE ENVIRONMENT**

**(NON-COMBAT)**

1. Outside Influences

**(COMBAT)**

2. Characteristics of the Enemy
3. Characteristics of the Location
4. Environmental Conditions

only by changes in developmental tasks, but also the specific situations individuals choose to enter and the strategies they use to adapt to these situations. These choices are based in part on the opportunities presented to the individual and in part on the characteristics the individual has developed as a result of past interactions. Furthermore, these individual choices appear to be made in an integrated fashion based on the individual's template and overall pattern of differential characteristics (Mumford & Owens, 1984; Mumford, Uhlman, & Kilcullen, in press; Mumford, Wesley, & Shaffer, 1987).

The implications of these observations is that a complex set of interactions will emerge between characteristics of the individual leader and the leadership situations to which they are exposed that give rise to a coherent and integrated, albeit changing, pattern of behavior (Gustafson & Magnusson, 1991; Magnusson, 1988; Owens & Schoenfeldt, 1979; Schoenfeldt, 1974). Because these patterns of interaction drive further development, they should, in turn, give rise to coherent patterns of differential development (Block, 1971; Mumford & Owens, 1984; Thomas & Chess, 1981). Such patterns of differential development should also emerge for leaders and thereby serve to condition career progression and pertinent developmental experiences. Thus, there would seem to be a need to take these developmental patterns into account in formulating a fully comprehensive model of leadership development. For instance, a self-template that emphasizes a contemplative, rather thoughtful life might cause a leader to be particularly adept at solving the kinds of problems likely to emerge in positions involving substantial long-term planning. Alternatively, leaders whose patterns emphasize task-oriented accomplishments may perform particularly well in situations where there is a compelling need to get a job done.

Although there is reason to suspect that these developmental patterns might influence leadership behavior, the factors giving rise to these patterns are quite complex. As a result, it may prove difficult, if not impossible, to specify the exact number and nature of these patterns on purely a priori theoretical grounds. Prior work by Owens and Schoenfeldt (1979), however, indicates that empirical procedures can be used to identify these patterns, and that a careful analysis of these empirically defined patterns of differential development can reveal a great deal about the developmental process.

### **Developmental Interventions**

If it is granted that this model provides a plausible basis for understanding leader performance and career development, then a new question comes to fore. What does this model tell us about the kind of interventions that might contribute to leader performance and the development of performance potential? To address this question, we will first outline some general considerations pertinent to the nature and sequencing of developmental interventions. We will then consider the implications of these observations, vis-à-vis current leadership development training strategies.

#### **General Principles**

Regardless of the particular role they are placed in, leaders will be expected to engage in discretionary problem solving. The notion that leaders must engage in discretionary problem solving in an ill-defined social domain has an important implication for leadership development programs. Effective programs must provide leaders with the capacities required to generate and implement the kind of problem solutions likely to be called for at different points in their careers.

**Knowledge:** In our model of leadership performance, we stressed the fundamental importance of knowledge. This emphasis is not at all surprising when it is recognized that knowledge is commonly held to provide the cognitive raw material that is the basis for most problem-solving efforts. Knowledge may be defined as an organized set of facts and principles pertaining to the characteristics of objects lying in some domain (Fleishman, 1972; Fleishman & Mumford, 1989b). Prior work by Chi, Gleser, and Rees (1982), Degroot (1966), Hallf, Holan, and Hutchins (1986), Leinhardt and Smith (1983), and Zechmeister, Resnick, and Markell (1986) indicates that expert problem solvers have more extensive knowledge structures, organized on the basis of underlying principles that serve to facilitate recognition and recall. Other work, by Gick and Holyoak (1980, 1983), Langley and Jones (1988), Simonton (1984, 1988), Sternberg (1988, 1989), and Weisberg (1988), indicates that up to some point knowledge also contributes to performance on novel problem-solving tasks calling for the generation, evaluation, and application of potential solution strategies.

Knowledge, however, should not be arbitrarily equated with the simple acquisition of information (Bromage & Mayer, 1986). People have little difficulty in acquiring discrete bits of information. Knowledge, however, appears more difficult to acquire, because it involves categorical structures, or schema, for identifying, relating, and understanding discrete bits of information (Rahman & Bisary, 1986; Ward, Byrnes, & Overton, 1990). These categories may reflect general taxonomic structures or ad hoc categories created by the individual to account for past experience.

A variety of studies have examined the factors that allow individuals to develop viable knowledge structures. Exposure to and practice with relevant material serves to provide a group of discrete facts that represent the groundwork for schema development. However, the development of these schema requires active, elaborative processing, as individuals search for principles that will organize this information into a coherent whole (Chi, Bassock, Lewis, Reimann, & Gleser, 1989). This active, elaborative processing makes rather intense demands on students.

Problem solving or outcome-based training does not appear to facilitate knowledge structure development (Sweller, 1988, 1989). Rather, developmental interventions that lead up to effective problem solving is more useful. First, these interventions illustrate guiding rules and organizing principles on core concepts (Dirnell & Glover, 1985; Owen & Sweller, 1985; Underwood, Briggs, & Underwood, 1984). Second, successful interventions incorporate materials and provide practices that explicitly seek to illustrate and encourage active application of these core principles in a logical manner (Fishbein, Ekart, Lauver, VanLeeuwen, & Lanomeyer, 1990; Grenno & Leinhardt, 1986; Lorch & Lorch, 1985). Third, these principles, materials, and exercises are presented in such a way that they attempt to gradually build up a set of expert structures (Comte, Verschaffel, & Dewin, 1985; Owen & Sweller, 1985). Fourth, this practice may become less structured, more independent, and more solution-oriented as individuals gain expertise (Snow & Lohman, 1984; Snow & Yallow, 1982).

**Appraisal Skills:** Traditionally, knowledge has been viewed as highly domain-specific. As a result, the role of cognitive processes and meta-cognitive skills in problem solving becomes significant. Hoover and Feldhusen (1990), for instance, studied hypothesis generation in ill-defined domains and found that the quality of the resulting hypotheses was conditioned by skill in finding a strong, viable solution or solution monitoring. Other research by Swanson (1990) and Beal, Garrod, and Bonitatibus (1990) have shown that training programs intended to develop appraisal skill, such as solution monitoring and problem definition, contribute to

learning and problem solving, even when basic cognitive abilities are taken into account. More centrally, however, Weed, Ryan, and Day (1990) have shown that these capacities contribute to the transfer of knowledge to new domains.

Many studies of appraisal skills have employed simple instructional manipulations and, therefore, do not speak to the development of these skills in training. This is unfortunate because these skills, in conjunction with well-organized extant structures, may provide the necessary background for solving novel or viable problems (Anderson, 1985; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). However, studies by Flower and Hayes (1986) provide a useful illustration of a relatively successful developmental strategy. After initial knowledge structures have begun to develop, students are asked to work on relevant problems. As part of preparatory instruction, different skills or processes bearing on the problem are described, and strategies for applying these skills are illustrated, along with their significance in problem solving. For example, one might describe core diagnostic cues or strategies for evaluating solutions, after which students are given practice in applying the appraisal skills, processes, or meta-cognitive capacities on illustrative problems drawn from multiple domains. Feedback is provided concerning the application of these particular skills, and this process is then extended to more complex problems involving multiple appraisal skills.

Obviously, training interventions of this sort can be integrated with the later phases of schema development efforts when trainees have begun to apply schema in problem solving. Integrated developmental efforts of this sort may, in fact, prove essential if individuals are to transfer knowledge and solve novel variable problems lying in certain domains (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991; Perkins, 1985). It should, however, be recognized that developmental efforts of this sort may take some time because some of the skills involved, such as combination and reorganization, are quite complex, and effective general schema do not develop rapidly. Thus, sequential, progressive, developmental efforts are called for that take into account the degree of student experience and begin with more simple, concrete problems requiring less complex skills which involve less complex and better defined domains that provide core representational systems and appraisal skills contributing to further development (Fleishman & Mumford, 1989b; Reif, 1990; Snow & Lohman, 1984).

**Discrete KSAPs:** Knowledge and embedded appraisal skills are important because they provide a base for situational choice and action selection. Action, practice, and experience, however, contribute to development of the discrete KSAPs required for certain kinds of task performances. Because these task-specific KSAPs make a direct contribution to performance, programs should also seek to develop these capacities.

The development of discrete performance skills, such as purchasing, accounting, or equipment maintenance, appears to be conditioned by practice on a certain class of tasks (Hulin, Henry, & Noon, 1989). The contribution of practice to skill acquisition, however, will be greater to the extent that the conditions of practice are similar to those observed on the job (Goldstein, 1986). Thus, on-the-job training and simulation exercises may provide useful tools for skill development.

Other research efforts have served to document a variety of other factors that influence skill acquisition. The work of Ackerman (1986, 1987) and Fleishman (1957, 1967, 1972; Fleishman & Hempel, 1954, 1955; Fleishman & Quaintance, 1984) indicates that the rate of skill acquisition is conditioned by the general abilities people possess. However, the specific nature or type of the abilities influencing skill acquisition may change as a function of practice, at least



under conditions where continuous, controlled processing is not called for. Based on the results obtained in these studies indicating that intellectual abilities are particularly important determinants of performance during the initial stages of skill acquisition (Ackerman, 1986, 1987; Fleishman, 1972), it seems reasonable to hypothesize that capacities that allow the individual to generate actions and evaluate their appropriateness may play an important role in skill acquisition (Salmoni, Schmidt, & Walter, 1985). This principle suggests that knowledge and embedded appraisal skills may, in fact, provide a cognitive framework for skill acquisition (Hasselhorn & Konkel, 1986).

It also appears that steps can be taken during practice to enhance the rate of skill acquisition. O'Donnell, Hall, Hythecker, Dansereau, Skaggs, Peel, and Reiley (1990), for instance, found that interventions providing action scripts and cooperative feedback contribute to skill acquisition. Other work by Beal, Garrod, and Bonitatibus (1990) and Salmoni, Schmidt, and Walter (1985) indicates that self-evaluation with respect to performance goals may contribute to skill acquisition, while Sleeman, Kelly, Martinak, Ward, and Moore (1989) and Resnick (1984) have provided evidence indicating that interventions targeted on task errors, especially those bearing on general principles, may facilitate the acquisition of skilled performance. In a similar view, Parker and Fleishman (1961) have shown that training interventions that take into account the abilities contributing to performance at a given stage of practice also facilitate skill acquisition.

Not only does it appear that discrete skills can be developed by structured practice in real-world settings, there is also reason to believe that this sort of practice may contribute to the development of other capacities. For instance, knowledge and understanding of the task at hand is likely to increase as a function of practice. Similarly, Bandura's (1986, 1989) research on social learning, as well as Howard and Bray's (1988) longitudinal study of managerial characteristics, suggests that task demands and practice may also induce changes in certain personality or temperamental characteristics, especially when coupled with social role modeling. Finally, Schooler's (1984) observations suggest that exposure to complex information processing tasks under different conditions may, over time, contribute to the development of general cognitive abilities.

**General Adaptive Characteristics:** Traditionally, basic cognitive abilities, as well as certain general motivational and personality characteristics, have been viewed as relatively fixed, enduring properties of the individual. Certainly, these characteristics often have a significant hereditary component (Scarr & Carter-Saltzman, 1982) and appear to develop rather slowly over substantial periods of time (Perkins, 1985; Schooler, 1984). Although heredity may set important bounds on the development of cognitive abilities (Tyler, 1965), there is evidence to suggest that environmental factors influence ability development. For instance, the work of Bayley (1968) and Scarr and Carter-Saltzman (1982) indicates that maternal behavior patterns, such as interpersonal warmth and teaching skills, may influence intellectual ability. Kagan, Sontag, Baker, and Nelson's (1958) work also suggests that childhood gains in IQ are related to an active, independent, aggressive approach that serves to facilitate exposure to demanding problem-solving tasks. These observations are of special interest, not only because similar trends are observed in adulthood, but also because the Mumford, O'Connor, Clifton, Connelly, and Zaccaro (1991) study cited earlier suggests that similar environment influences may be related to later leadership activities.

Not only is there reason to suspect that environmental variables contribute to the development of intellectual capacity, Fiedler and Garcia (1987) point out that certain

environmental conditions may influence the effective application of these capacities. For instance, stress and conflict may make it difficult for people to apply their intelligence in problem solving (Fiedler & Garcia, 1987) or generate novel, effective solutions (Mumford, Reiter-Palmon, & Redmond, in press; Redmond, Mumford, & Teach, in press). Hence, development efforts might also seek to facilitate the application of basic cognitive capacities to the kind of problems emerging in a certain domain.

In a recent review of training programs concerned with the development of basic abilities (e.g., Alexander, White, Hanesly, & Jeaner, 1986; Davey & McBride, 1986; Fitzgerald & Teasley, 1986; Genter & Toupin, 1986; Kyllonen, Lohman, & Snow, 1984; McGee, 1979; White & Alexander, 1986), Fleishman and Mumford (1989a) concluded that successful ability development programs share certain features. First, the more successful interventions appear to be those that systematically identify component processes or strategies and provide training in their application to a variety of task domains. Second, this training is more likely to prove effective when process or strategy application is explained and modeled and when feedback is provided concerning the effectiveness of process application in problem solving. Third, effective training appears to require the construction of exercises that encourage active practice and facilitate the use of deep or elaborative processing strategies. Fourth, it appears that the effective interventions require more time as the breadth of the ability under consideration increases.

In some senses, the success of interventions of this sort is not surprising. Medin and Ross (in press) have argued that ability development often derives from case-based analogical reasoning. The kind of training interventions described above would, of course, provide a groundwork for controlled case-based reasoning. This observation, in turn, suggests that developmental efforts of this sort might prove especially effective if they focus on certain kinds of problem-solving activities, such as leaders' discretionary problem solving.

It should also be recognized that these successful developmental interventions are also designed in such a way that they would facilitate the application of extant abilities to the kind of problems likely to arise in a certain domain. In the creative problem-solving literature, a variety of training programs have been devised that are explicitly intended to facilitate the application of various abilities contributing to creative thought (Baer, 1988; Covington, 1987). In a recent meta-analysis of this literature, Rose and Lin (1984) found that training programs of this sort often lead to improved creative problem solving. Recent analysis of the specific kinds of interventions resulting in improved performance has been completed by Edwards and Sproull (1984) and is summarized in Table 11. Broadly speaking, studies that attempted to concentrate cognitive efforts by means of time or stress management or via visualization tended to contribute to the generation of novel, effective problem solutions.

Earlier we argued that certain general personality characteristics and motivational attributes also influence performance on problem-solving tasks as well as the development of task-specific KSAPs and embedded appraisal skills. At this juncture, the literature makes it difficult to draw firm conclusions about exactly how one should go about developing these attributes, due to the performance-based focus of most training efforts. Based on the nature of these characteristics and the findings obtained in studies of management development and socialization (Feldman, 1989; Howard & Bray, 1988) as well as personality development (Shaffer, 1985; Bandura, 1989; Kenrick & Funder, 1988), it does appear that attributes, such as openness, ego resiliency, and self-awareness, can be developed. Although the literature is diffuse, it appears that social role modeling and practice in "real-world" contexts that explicitly

Table 11. Novel Problem-Solving Training Strategies

TRAINING	AUTHORS																						
	Gordon (61)	Osborn (63)	Prince (70)	Dalton (71)	Edwards (75)	Kafka (75)	Thompson (76)	Alpaugh (77)	Souder (77)	Mackinnon (78)	Cates (79)	Hermone (79)	Jewkes (79)	Miller (79)	Rickards (79)	Shearning (79)	Glover (80)	Howard (80)	Dauw (80)	LeBoeuf (80)	Brightman (81)	Dubin (81)	Raudsepp (81)
Problem Solving	X	X	X		X	X			X		X	X	X		X	X	X	X	X	X	X		
Synectics	X	X	X		X				X						X	X			X	X	X		
Brainstorming	X	X	X		X				X			X			X	X		X	X	X	X		
Left/Right Brain			X		X			X	X			X			X	X	X	X	X	X	X		
Counseling/Listening	X		X		X	X	X	X	X		X	X	X		X	X	X	X	X	X	X		
Management Style/ Participative Management	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Mental Flexibility/Imagery	X	X	X		X		X		X		X	X			X	X	X	X	X	X	X	X	X
Relaxation/Meditation	X	X			X							X			X	X	X	X	X	X	X		
Reduce Self-Judgment	X		X		X		X		X			X			X	X	X	X	X	X	X		
Organizational Change				X		X	X	X							X		X				X		
Intuitive	X	X	X		X	X	X	X	X			X			X		X		X		X	X	X
Diagnosis			X		X	X									X	X	X	X	X	X	X	X	X
Time/Stress Management															X	X	X				X	X	X

(From Edwards & Sproull, 1982)

illustrate how these attributes contribute to the attainment of desirable outcomes influence the development of these characteristics. This seems especially likely to hold true when the individual's motive and value pattern is already consistent with these developmental needs and when the personal instrumentality of those motives and values can be modeled and is consistently reinforced in social interaction.

### **Leadership Training**

When these principles for the development of various capacities are considered with respect to the nature of leader performance and the sequential and progressive changes characterizing organizational leadership roles, they provide some concrete suggestions about the kind of training likely to be called for as people move through different kinds of leadership roles. In the ensuing discussion, we will attempt to outline the nature of an idealized training system based on these principles.

**Unit Leadership Development:** Throughout their careers, leaders must solve ill-defined problems associated with their roles in the organizational system. As noted above, embryonic leaders lack relevant forms of knowledge and embedded appraisal skills needed to provide a basis for situational appraisal and action selection. There is, therefore, a need to develop these characteristics in a population lacking expertise. These developmental interventions should, moreover, be designed in such a way that they provide a strong foundation for further learning. The objectives, however, must take into account the zone of proximal development. More specifically, the kind of problems presented in training cannot be overly esoteric, but must provide the basic cognitive structures needed to solve components of more complex problems.

These observations, of course, suggest that initial training should focus on the development of basic knowledge structures by providing basic facts and principles and the essential features of the structures used to organize this information. This initial instruction should first focus on the nature and objectives of the organization, and then proceed to the nature of the core unit to which the individual will be assigned, stressing material and personnel knowledge applying in the core unit to which the individual will be assigned.

Once this basic knowledge has been provided, training should proceed to simplified field and role-playing exercises. This training should present relevant problems that are not so complex and performance-driven that they interfere with further learning (Owen & Sweller, 1985). These exercises should be designed to illustrate knowledge application and show how embedded appraisal skills, such as solution monitoring, information encoding, empathy, or coaching, contribute to effective discretionary problem solving. Furthermore, feedback should not focus on performance per se. Rather, it should focus on knowledge and skill application in the context of these limited, relatively concrete leadership problems. In the course of these exercises, problem content, feedback, and role modeling should be used to develop crucial noncognitive characteristics, such as self-esteem, self-awareness, solution monitoring, and ego control, that are likely to contribute to further learning.

After this initial training, on-the-job training should occur. This training should provide leaders with practice solving concrete, simple, core unit leadership problems under conditions where performance can be carefully monitored and systematic developmental feedback provided. These on-the-job experiences will, of course, contribute to skill development and to the elaboration and refinement of initial knowledge structures.

As the individual begins to move into the role of unit executive officer or lieutenant, a new set of developmental interventions is likely to be called for. At this point, the individual will be expected to solve significant core unit operating problems, and these initial, independent problem solutions may make a particularly important contribution to later career development. Thus, more intense advanced training should be provided to ensure that individuals are capable of solving these problems in an effective and timely fashion. This training should begin with knowledge-based training intended to provide a more sophisticated or elaborate understanding of the material and personnel problems likely to arise in core unit operations. Subsequently, a complex set of case studies and field exercises should be designed that provide practice in applying more complex embedded appraisal skills, such as evaluation of discrepancy importance, the selection of solution components, and interpersonal sensitivity, in solving these material and personnel problems. This training, in conjunction with subsequent on-the-job experience, should provide an intimate familiarity with core unit leadership problems while instilling a concern with investigation, responsibility, and practicality provided that subsequent job experiences stress the need for solving operational problems.

Experience as a unit executive officer will provide leaders with much of the knowledge and expertise required to function as a core unit leader. At this juncture, however, a somewhat peculiar, albeit significant, developmental problem comes to fore. This is the first point in leaders' careers where they will be asked to coordinate and direct the activities of others to maintain unit performance and ensure the attainment of unit objectives. Thus, at this juncture, classical management functions, such as prioritizing, planning, coordination, and communication, are likely to become important determinants of performance. Training courses can, of course, be constructed to develop these capacities in the context of core unit operations, and exposure to this training may represent a necessary prerequisite for assignment to core unit leadership positions. This training, however, should stress the cognitive basis for command through realistic problem-solving exercises while developing characteristics, such as organization, selective attention, emotional control, autonomy, problem sensitivity, and fluency of ideas, likely to facilitate the application of these cognitive directive skills under stressful and pressured conditions (Fiedler & Garcia, 1987; Mintzberg, 1990).

**Multiunit Leadership Development:** Movement into multiunit leadership positions is likely to represent a major developmental transition. Leader must possess a broader, far more complex knowledge structure and a more abstract logical approach emphasizing deductive and inductive reasoning. Thus, training should provide individuals with skills likely to lead to viable problem solutions in a more complex and dynamic social setting. Such skills include flexibility, adaptability, social adroitness, mastery motives, risk taking, and written and oral expression.

Because multiunit leadership requires new and more complex knowledge structures, development for these positions is likely to begin with knowledge-based training. This training should build a general understanding of the functional roles of different units and their potential contributions to the attainment of various multiunit operational objectives. This training should, of course, attempt to define knowledge structured around core organizing principles and illustrate the interdependencies among core units. Following this initial knowledge structure development, training should proceed to case studies, role-playing exercises, and organizing exercises, where the individual is expected to use various units under different operating conditions to attain various objectives. This problem-solving training should not only emphasize the generation, evaluation, and implementation of alternative solutions, it should also stress the kind of information that should be sought, the principles that can be applied in problem solving, and the type of problems likely to be encountered by different units under different conditions.

Although training of this sort may provide a functional basis for solving multiunit leadership problems, it should be recognized that these problems are more abstract and involve a substantial inductive and deductive reasoning component. The development of these complex cognitive skills under conditions likely to facilitate their application to multiunit problems will, therefore, require an extended period of practice typically dealing with more complex multiunit problems lying in a limited domain. Many staff positions will offer this requisite experience, provided that they encourage individuals to analyze certain kinds of multiunit problems and permit them to consider alternative approaches for addressing significant aspects of multiunit problems.

Hopefully, these experiences will provide people with the cognitive background and problem-solving skills required in multiunit positions. At this juncture, the leader may then be ready to assume the role of multiunit executive officer charged with addressing multiunit operational problems. This position should emphasize the generation of solutions to nonroutine problems, especially those involving the coordinated application of multiple units to problems where multiple cues and issues must be addressed to define and evaluate alternative action plans capable of bringing about the attainment of operational objectives. This experience should, in turn, prepare individuals for multiunit leadership. Multiunit leadership, however, may require substantially greater problem sensitivity, responsibility, risk taking, and awareness of the system's goals and objectives.

**Subsystem Leadership Development:** Movement into subsystem leadership positions will involve another major transition. Here, leaders will be confronted with more long-term problems focusing on subsystem maintenance and enhancement. Furthermore, leaders will be expected to define the parameters, conditions, and expectations for multiunit operations. One implication of this statement is that while subsystem leaders must understand multiunit operations, they must also be able to understand and evaluate long-term changes in the social and technical framework within which these units must operate and identify and solve problems permitting effective operations. Further, leaders must define the objectives and operating procedures for multiunit actions.

Hence, training for subsystem leadership positions may require knowledge of broader technical and social issues conditioning the nature and success of subsystem actions. Additionally, this training should emphasize complex problem solving over extended periods of time where capabilities and resources are subject to change while illustrating and providing practice in defining action objectives. In the course of solving these problems, feedback and practice should also be provided as it pertains to various conditions and strategies that influence the attainment of different objectives. Furthermore, these problem-solving exercises should stress relevant skills, such as problem anticipation, problem definition, planning, negotiating skills, evaluation of discrepancy importance, cognitive complexity, mastery motives, and tolerance for ambiguity, all of which may have a marked impact on leaders' ability to define subsystem objectives and provide the structure that will contribute to later successful multiunit operations.

Developmental interventions of this sort are likely to be quite lengthy and complex, in part because the requisite knowledge becomes more complex and diverse, and in part because leaders must now create or define subsystem structures that will contribute to attaining a number of different objectives at various points in time under a number of different conditions. This implies that subsystem leaders will need a certain amount of creative problem-solving skills as well as substantial reasoning capacity, especially deductive reasoning. The development of these capacities in a practical context may require substantial preparation in classroom exercises

presenting case studies, games, and simulation exercises where leaders are required to anticipate changes and generate viable alternative solution plans in response to changes in technology, objectives, manpower, and operating environments.

This classroom training in subsystem leadership problems cannot fully prepare individuals to solve these problems because of their scope, diversity, and time span. Thus, development requires some practical experience in the identification and analysis of subsystem problems and subsequent generation of frameworks for their solution. This observation suggests that subsystem leaders might benefit from a period of experience where they are specifically tasked with developing plans for addressing relatively long-term subsystem problems lying in certain subdomains, followed by exposure to executive officer roles where they are tasked with identifying subsystem problems and generating alternative approaches to these problems. These experiences should, in turn, provide the background required for subsystem leadership roles. Here, however, the subsystem leader must be capable of integrating multiple kinds of information, evaluating or projecting its different implications, and then defining problems and evaluating plans for addressing these problems. Thus, subsystem leaders must have a stronger capacity for organizing and evaluating information in relation to plans intended to provide a structure for multiunit actions. Thus, throughout this period, substantial attention should be given to information acquisition, information evaluation, problem definition, and planning skills in both formal training and on-the-job experiences such that the importance of these capacities is illustrated, strategies facilitating their application modeled, and feedback given with regard to their application in problem solving.

**System Leadership Development:** Unlike subsystem leaders, who are charged with the long-term development and maintenance of major organizational functions, system leadership roles are concerned with guiding system adaptation to the broader social environment. System leadership, as a result, requires greater movement in, responsiveness to, and awareness of the surrounding social environment. Such leadership also necessitates the cognitive capacities that will allow leader role occupants to understand these environmental events and establish subsystems, objectives, cultures, and technologies that will permit the organization to adapt to long-term environmental demands. One implication of these observations is that system leadership will require a broader, more cosmopolitan understanding of the environment in which the system must operate, as well as the ability to formulate plans and structure for guiding adaption to environmental demands.

The need to cope with the broader environmental and related systems implies that movement into system leadership positions will result in a marked shift in the demands placed on organizational leaders. Thus, training programs might be implemented to provide system leaders with exposure to or an understanding of other relevant systems. This training might take the form of classroom instruction intended to provide a basic working understanding of the nature, operations, and objectives of central constituencies and competitors. Additionally, assignment to liaison positions or joint working groups might contribute to the development of a broader knowledge base.

In addition to the development of a more cosmopolitan knowledge structure, system leaders must develop skills such as social adroitness, interpersonal sensitivity, empathy, investigation skills, entrepreneurial values, and political values that will allow them to interact effectively with the members of allied systems. Furthermore, the need to project broader environmental changes and develop plans that will allow the organization to adapt to these changes suggests that upper-level leadership positions will make strong demands on creative

cognitive capacities, including reasoning, originality, category combination and reorganization, information encoding, solution evaluation, problem sensitivity, and problem definition. Thus, some form of training or educational experiences seem called for that involves the generation and analysis of novel solutions to system-level problems. This training might involve case studies, lectures, and gaming exercises. It should, however, carefully illustrate the application of embedded appraisal skills developed here or in other contexts to complex system-level problems while encouraging the application of creative problem-solving processes in generating plans for adapting to environmental change events.

Finally, this training should explicitly seek to develop characteristics, such as openness, tolerance for ambiguity, flexibility, self-awareness, and wisdom, that make it possible to generate and implement these solutions in a complex, multifaceted social context. Given the level of the leaders under consideration, guided peer review and feedback of performance in problem-solving exercises may provide a viable strategy for modeling and developing these characteristics. This strategy, in conjunction with the prior career experiences of peers, may also help to ensure commitment to the organization's well-being and development of a shared vision among candidate system leaders.

Following these structured, development experiences, system leaders are likely to move into a system staff role. Here, leaders will be expected to identify potential environmental changes and develop plans for addressing these events that take into account both subsystem capabilities and the likely objectives, actions, and capabilities of allied or competing systems. This staff role will serve to further develop the requisite knowledge, cognitive skills, and social skills while providing system leaders with the background information required for making effective overall decisions. Further, in day-to-day interaction with system leaders, role modeling should encourage system staff members to develop the vision, wisdom, charisma, and complex evaluative skills that, in conjunction with intelligence and creativity, allow leaders to direct the adaptive efforts of complex integrated systems.

### **Review of Past Leader Training Interventions**

In the previous section of this report, we have proposed a number of principles for the development of high level leaders. We believe developmental interventions based on these principles should greatly facilitate the progressive acquisition and refinement of critical leader KSAPs and in turn promote the important behavior patterns identified in the taxonomy of leadership performance. Of particular interest at this point is the efficacy of prior attempts at leadership training to develop the critical leader characteristics and behaviors identified in this report. Accordingly, a review was conducted of the training literature to identify those studies targeting the development of leadership capacities. The studies used by Burke and Day (1986) in their meta-analysis of leader training interventions was used as a starting point. Then, computerized searches of the literature (i.e., PsychLit) published since 1985 were conducted to identify additional studies. Studies that did not provide a clear description of their specific interventions or failed to include a sufficient criterion for training success were excluded from consideration. This review identified 64 useable studies which are listed in Appendix F.

Each study was then rated by three psychologists and two psychology graduate students on the extent to which the described intervention (a) targeted each of the thirteen leadership dimensions listed in the taxonomy of leadership behavior, and (b) facilitated the acquisition or refinement of each characteristic indicated in the taxonomy of leader KSAPs. Raters used five-point rating scales, with "1" indicating that the training intervention was low on the LBDs and



Table 12. Leader Behavior Dimensions--Training Program Ratings

Dimensions	Mean of Successful Training Programs	Mean of Unsuccessful Training Programs	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>A. Information Search and Structuring</b>						
1. Acquiring Information	2.3557	2.0783	2.2095	.547	1.400-3.800	.0000-1.3038
2. Organizing and Evaluating	2.6040	2.3494	2.4698	.631	1.400-4.200	.4472-1.3038
3. Feed and Control	2.2215	2.2289	2.2254	.617	1.000-3.800	.0000-1.5166
<b>B. Information Use in Problem Solving</b>						
4. Identifying Needs and Requirements	2.4527	2.3152	2.3802	.689	1.200-4.000	.4472-1.3038
5. Planning and Coordinating	1.9664	1.9880	1.9778	.805	1.000-4.800	.0000-1.7078
6. Communicating Information	2.4430	2.8193	2.6413	.771	1.400-4.600	.4472-1.4832
<b>C. Managing Personnel Resources</b>						
7. Obtaining and Allocating	1.5638	1.6506	1.6095	.527	1.000-3.000	.0000-1.6432
8. Developing Personnel Resources	2.2416	2.4699	2.3619	.805	1.200-4.000	.0000-1.4142
9. Motivating Personnel Resources	2.4362	2.9217	2.6921	.968	1.200-4.600	.0000-1.3416
10. Utilizing and Monitoring Personnel Resources	2.4094	2.6386	2.5302	.837	1.200-4.200	.4472-1.7889
<b>D. Managing Material Resources</b>						
11. Obtaining and Allocating Material Resources	1.2819	1.2410	1.2603	.452	1.000-3.000	.0000-1.4142
12. Maintaining Material Resources	1.2483	1.1747	1.2095	.419	1.000-3.400	.0000-1.4142
13. Utilizing and Monitoring Material Resources	1.4966	1.3373	1.4127	.633	1.000-4.200	.0000-1.3038

Table 13. Leader KSAPs--Training Program Ratings

Dimensions	Mean of Successful Training Programs	Mean of Unsuccessful Training Programs	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Cognitive Generating Factors</b>						
1. General Cognitive Intelligence						
A. Problem Anticipating	2.0201	1.9878	2.0032	.609	1.000-3.600	.0000-1.4142
B. Inductive Reasoning	1.8514	1.7590	1.8025	.594	1.000-3.400	.0000-1.2247
C. Deductive Reasoning	1.9189	1.6867	1.7962	.571	1.000-3.600	.0000-1.3038
D. Time Sharing	1.3919	1.3675	1.3790	.388	1.000-2.800	.0000-1.4832
2. Creativity						
A. Definition of Problem	2.2550	2.1627	2.2063	.599	1.200-3.800	.4472-1.5166
B. Fluency	1.9597	1.9398	1.9492	.742	1.200-3.600	.0000-1.6432
C. Originality	1.5503	1.5241	1.5365	.659	1.000-3.800	.0000-1.3038
3. Crystallized Cognitive Skills						
A. Oral Comprehension	2.2886	2.4085	2.3514	.584	1.000-3.400	.0000-1.6432
B. Written Comprehension	1.7248	1.5241	1.6190	.569	1.000-3.800	.0000-1.7889
C. Oral Expression	2.2685	2.5783	2.4317	.649	1.200-3.800	.0000-1.3416
D. Written Expression	1.5772	1.4398	1.5048	.517	1.000-3.400	.0000-1.4142
E. Information Ordering	1.7770	1.7169	1.7452	.543	1.000-3.600	.0000-1.4142
F. Selective Attention	1.4932	1.5361	1.5159	.430	1.000-3.000	.0000-1.2247
G. Technical Ability	2.0169	1.7518	1.8726	.666	1.000-4.400	.0000-1.8257

Table 13. Leader KSAPs--Training Program Ratings (Continued)

Dimensions	Mean of Successful Training Programs	Mean of Unsuccessful Training Programs	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Personality</b>						
1. Adaptability/Ego Resiliency						
A. Adaptability	2.1745	2.1386	2.1556	.651	1.000-3.800	.0000-1.2247
B. Emotional Control	1.9128	2.0482	1.9841	.695	1.000-4.000	.0000-1.4142
C. Self-Esteem	2.0268	1.9880	2.0063	.606	1.200-3.600	.4472-1.1402
D. Risk Taking	1.4832	1.6747	1.5841	.550	1.000-4.200	.0000-1.3038
E. Performance Motivation	1.7959	1.5663	1.6741	.693	1.000-4.600	.0000-1.5166
F. Energy Level	1.4362	1.4096	1.4222	.397	1.000-2.800	.0000-1.6432
G. Sensing	1.8983	1.9362	1.9189	.497	1.000-3.000	.0000-1.5166
2. Openness/Curiosity						
A. Cognitive Complexity	2.0000	1.6988	1.8413	.544	1.000-3.400	.0000-1.3038
B. Openness to Experience	2.2013	2.1446	2.1714	.639	1.400-4.400	.4472-1.5811
C. Investigative	2.3020	2.0120	2.1492	.588	1.200-3.400	.4472-1.4142
D. Tolerance for Ambiguity	2.2282	2.2606	2.2452	.616	1.200-4.000	.4472-1.5811
E. Intuition	1.6441	1.7943	1.7259	.462	1.000-3.000	.0000-1.1402
F. Thinking	1.9746	1.7730	1.8649	.490	1.000-3.000	.0000-1.2247
G. Perception	1.7373	1.6454	1.6873	.380	1.000-2.600	.0000-1.7889
3. Self-Awareness						
A. Internal Locus of Control	1.7785	1.8193	1.8000	.545	1.000-3.800	.0000-1.3416
B. Self-Appraisal	2.3305	2.2482	2.2857	.627	1.400-4.000	.0000-1.5166
C. Tolerance for Failure	1.4831	1.5745	1.5328	.650	1.000-2.600	.0000-1.3038
D. Discretion (Ego Control)	1.9224	1.8394	1.8775	.430	1.000-3.000	.0000-1.5000

Table 13. Leader KSAPs--Training Program Ratings (Continued)

Dimensions	Mean of Successful Training Programs	Mean of Unsuccessful Training Programs	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Values and Motives</b>						
<b>1. Achievement</b>						
A. Achievement (Value)	1.8054	1.6687	1.7333	.654	1.000-3.600	.0000-1.4142
B. Self-Expression	1.8591	2.0723	1.9714	.666	1.000-4.000	.0000-1.4832
C. Mastery Motives	2.0508	1.6950	1.8571	.650	1.200-5.000	.0000-1.3416
D. Autonomy	1.4899	1.4518	1.4698	.371	1.000-2.400	.0000-1.4142
<b>2. Need for Dominance</b>						
A. Need for Power	1.6107	1.7952	1.7079	.513	1.000-3.400	.0000-1.4142
B. Political	2.0470	2.1265	2.0889	.566	1.200-3.200	.0000-1.6432
C. Judgment	1.7288	1.6738	1.6988	.336	1.000-2.200	.0000-1.3038
D. Enterprising	1.7905	1.9096	1.8535	.591	1.200-3.600	.0000-1.7889
<b>3. Commitment to Social Systems</b>						
A. Responsibility	1.6443	1.6807	1.6635	.506	1.000-2.600	.0000-1.3416
B. Social	2.4430	2.8434	2.6540	.912	1.000-4.800	.0000-1.4142
C. Social Alienation (-)	1.0847	1.2199	1.1583	.189	1.000-1.800	.0000-.8944
D. Object Belief (-)	1.5424	1.5816	1.5637	.445	1.000-3.000	.0000-1.3416
E. Coaching	2.0268	2.3499	2.1968	.956	1.000-4.600	.0000-1.5166

Table 13. Leader KSAPs--Training Program Ratings (Continued)

Dimensions	Mean of Successful Training Programs	Mean of Unsuccessful Training Programs	Mean	S.D. of Means	Range of Means	Range of Original S.D.s
<b>Embedded Appraisal and Implementation Skills</b>						
<b>1. Practical Intelligence</b>						
A. Monitoring Goal-Relevant Cues	2.4054	2.1928	2.2930	.684	1.400-4.200	.4472-1.5166
B. Selection of Solution Components	2.0946	2.0181	2.0541	.497	1.400-3.400	.4472-1.3038
C. Information Appraisal	2.3893	2.2048	2.2921	.537	1.400-4.000	.4472-1.1402
D. Information Gathering and Encoding	2.3758	2.1758	2.2707	.585	1.400-4.000	.0000-1.3416
E. Planning and Implementation	2.0676	2.0000	2.0319	.858	1.000-4.000	.0000-1.6432
F. Evaluation of Discrepancy Importance	2.1342	2.0241	2.0762	.565	1.000-3.200	.4472-1.6432
G. Monitoring Implementation and Solution Outcomes	2.0537	2.0241	2.0381	.695	1.000-3.800	.4472-1.6432
H. Problem Sensitivity	2.3423	2.2771	2.3079	.574	1.250-3.600	.4472-1.1402
I. Prioritizing	1.6242	1.6024	1.6127	.612	1.000-2.800	.0000-1.3416
J. Implementation of Solution	1.7987	1.8976	1.8508	.645	1.000-3.400	.0000-1.5166
K. Administrative Skill	2.1695	2.1773	2.1737	.706	1.000-4.000	.0000-1.5166
<b>2. Social Intelligence</b>						
A. Interpersonal Sensitivity	2.5973	3.1506	2.8889	1.031	1.000-4.800	.0000-1.7889
B. Social Confidence	2.0940	2.3373	2.2222	.723	1.000-3.800	.0000-1.6733
C. Empathy	2.1275	2.6807	2.4190	.947	1.000-4.800	.0000-1.4142
D. Wisdom	1.8983	1.7305	1.8069	.464	1.000-3.600	.0000-1.3416
E. Feeling	1.8729	2.2057	2.0541	.743	1.000-3.600	.0000-1.3038
F. Negotiation Skills	2.1678	2.6687	2.4317	.929	1.200-4.000	.0000-1.5166
G. Social Adroitness	2.2819	2.5904	2.4444	.945	1.000-4.400	.0000-1.3038
H. Adherence to Procedures	1.7119	1.7234	1.7181	.581	1.000-3.400	.0000-1.3416
I. Norm Sensitivity (Social Conformity)	1.5508	1.7447	1.6564	.361	1.000-2.400	.0000-1.7889

leader KSAPs and "5" indicating that the study was judged as high in terms of targeting the LBDs and leader KSAPs. In addition, two raters reviewed the performance criteria and results of each study and judged on three-point scales the degree of success achieved by the study's training intervention (1 = unsuccessful; 3 = successful). Descriptive data from these analyses are shown in Tables 12 and 13.

**Training of Leader Behavior Dimensions:** Table 12 indicates mean ratings of the LBDs across five raters and 64 training interventions. These data provide several important observations. First, taken together, prior leadership training studies did not target to a great extent any of the LBDs. The highest mean was 2.69 for motivating personnel resources. Indeed, for seven of the 13 LBDs, the highest mean rating for any of the 64 studies did not exceed 4 on the 5-point scale. Second, planning and coordinating activities were rated surprisingly low (mean = 1.98) in terms of training focus. This rating is startling given the centrality of such activities to functional leadership and their importance as highlighted in many taxonomies of leadership behavior (see Table 2). Third, extremely low ratings were given to the set of activities encompassing the management of material resources. This failure of previous training efforts to target these activities is especially critical for Army leaders given that 16% of the tasks completed by such leaders involved material management (see Table 3). A fourth and final observation pertains to the overall pattern of differences in the mean ratings of successful versus unsuccessful programs. This general pattern, indicated in Table 12, suggests that successful programs tend to target activities linked to information search and structuring and managing material resources more so than unsuccessful training programs (although as noted, overall means are generally quite low). Alternatively, unsuccessful programs tended to focus on activities related to personnel management more so than successful programs. Information utilization activities did not appear to be differentially targeted across successful and unsuccessful interventions.

**Training of Leader KSAPs:** Table 13 presents the mean ratings of the proposed KSAPs. These data yield two critical points. First, as with the LBDs, prior training studies did not focus strongly on any of the KSAPs. The characteristic with the highest mean rating was interpersonal sensitivity (mean = 2.89). As sets of KSAPs, social intelligence and practical intelligence skills were rated relatively higher than the other sets (mean ratings of 2.18 and 2.09, respectively). Indeed, no other set of proposed leader KSAPs achieved a mean rating higher than 1.96.

Second, across all 65 KSAPs mean ratings of successful training programs did not differ greatly from those of unsuccessful programs. Thirty-six KSAPs had higher mean ratings on successful programs, while 29 KSAPs were rated higher on unsuccessful programs. However, ratings of successful and unsuccessful programs aggregated by the 11 categories in the KSAP model indicate clear patterns of mean differences. On successful programs, all of the KSAPs subsumed under the general cognitive intelligence and creativity subdimensions were rated higher than on unsuccessful programs. Four of the seven KSAPs under crystallized cognitive skills had higher ratings for successful than unsuccessful interventions. Taken together, then, 11 of the 14 KSAPs subsumed under the dimension of cognitive generating factors had higher ratings for successful training programs (although, as noted, all of these means were quite low). For the personality constructs, 11 of 18 were rated higher for successful than unsuccessful programs. The KSAPs subsumed under the dimension of values and motives yielded opposite patterns. Three of the four achievement values were higher for successful interventions; however three of four need for dominance constructs and all of the variables related to commitment to social systems had higher mean ratings for unsuccessful interventions. A similar conflicting pattern emerged from the data on embedded appraisal skills. Successful programs

**Table 14. Blocked Regression Results for Training Program Success Criteria**

		Regression Weights <sup>a</sup> : Training Program Success <sup>b</sup>
<b>Block 1</b>	Practical Intelligence	.05
	Deductive Reasoning	.20
	Inductive Reasoning	-.18
	Creativity	.10
	Multiple R for block $R_v^c =$	.20
<b>Block 2</b>	Practice Intelligence	.03
	Deductive Reasoning	.17
	Inductive Reasoning	-.20
	Creativity	.08
	Energy	.07
	Work Ethic	-.03
	Achievement Motivation	.11
	Multiple R for block $R_v^c =$	.25
<b>Block 3</b>	Practice Intelligence	-.05
	Deductive Reasoning	.19
	Inductive Reasoning	-.26
	Creativity	.03
	Energy	.07
	Work Ethic	-.02
	Achievement Motivation	.16
	Social Skills	.17
	Persuasive/Dominance	-.01
	Institutional Adaptation	-.25
	Social Adjustment	-.01
	Multiple R for block $R_v^c =$	.34
<b>Block 4</b>	Practice Intelligence	-.11
	Deductive Reasoning	.16
	Inductive Reasoning	-.12
	Creativity	-.06
	Energy	.06
	Work Ethic	.05
	Achievement Motivation	.09
	Social Skills	.24
	Persuasive/Dominance	-.03
	Institutional Adaptation	-.39
	Social Adjustment	-.21
	Independence	-.46
	Personal Adjustment	.48
	Openness	.25
	Positive Temperament	.01
	Self-Esteem	.06
	Multiple R for block $R_v^c =$	.53

Note<sup>a</sup>: Regression weights obtained when block was first entered.

Note<sup>b</sup>: No cross-validation was conducted for the training success analyses due to the small N size.

Note<sup>c</sup>:  $R_v$  designates validation sample multiple R for block.

yielded higher ratings of nine of the 11 practical intelligence skills; however, only one of the nine social intelligence skills was rated more highly on programs judged as successes than those perceived as failures.

These data were also used in a policy-capturing study by Mumford, O'Connor, Clifton, Connelly, and Zaccaro (1991) to evaluate the degree to which KSAP ratings predicted training program success. Regression analyses were used in which the criterion was a dichotomous measure reflecting whether the training program did or did not yield performance gains; the predictors were ratings by five psychologists of 16 variables as to the extent to which the program would contribute to its development. More specifically, in this analysis, clusters of four cognitive variables, three motivational variables, four social skills, and five personality constructs were entered in steps into an equation predicting training success (see Table 7, Blocks 1-4). The statistics of interest are the increments in multiple Rs as more KSAPs that are potentially captured by the training intervention are entered into the prediction of its success (it should be pointed out that the nonnormal distribution of ratings means that the resulting multiple Rs and regression weights should be treated as descriptive rather than inferential statistics).

The results of these analyses are shown in Table 14. As may be seen, when the four cognitive variables were entered, they yielded a multiple R of .20, with deductive reasoning ( $b = .20$ ) and creativity ( $b = .10$ ) yielding the largest regression weights. The negative weight ( $b = -.18$ ) produced by inductive reasoning might at first glance appear inconsistent with our earlier reasoning. This finding, however, might be attributed to the tendency of programs receiving high ratings on this dimension to focus on discrete facts rather than the abstract principles that provide a basis for discretionary problem solving in novel situations. When the motivational constructs, achievement motivation, work ethic, and energy were entered into the regression equation, the multiple R increased to .25. Again, achievement motivation ( $b = .11$ ) yielded the largest regression weight, suggesting that training programs stressing the value of accomplishment contributed to managerial performance. Addition of the social skills constructs resulted in a multiple R of .34. Here, it was found that training programs held to develop social skills ( $b = .17$ ) contribute to managerial performance, while training programs that stressed institutional adaptation ( $b = -.25$ ) tended to be somewhat less successful. This latter finding, however, may not represent fit per se and the capability for working in a social context, but rather the tendency of these training programs to stress social conformity. Addition of the personality constructs also led to a sizable increase in overall predictive power, producing a multiple R of .53. The personal adjustment ( $b = .48$ ) and openness ( $b = .25$ ) dimensions yielded the largest positive weights, indicating that programs that promoted a flexible, adaptive, open orientation towards solving problems resulted in greater performance gains. Taken together, these results show that as more leader KSAPs are "captured" by developmental efforts, the more successful these training interventions will be.

**Summary and Conclusions:** A strong conclusion that emerges from these analyses is that prior training programs and developmental interventions are deficient in fostering both the leadership behaviors underlying discretionary and creative problem-solving in ill-defined domains and the leader characteristics that effectively condition these behavior patterns. The behaviors and individual qualities that have received the most attention, relative to other components of leadership, have been those related to the management of personnel. This is not surprising given that a significant proportion of the leader development studies in the literature emphasize sensitivity training and the refinement of human relations skills. However, as pointed out in our theory of organizational leadership and model of leader characteristics, personnel management is one part of the creative problem-solving process and is perhaps most critical in the implementation of problem solutions. If cognitive factors and practical intelligence skills that



underlie successful problem-solving are not developed in tandem with personnel relations skills, then the latter characteristics are unlikely to result in significant improvements in leadership.

This point is illustrated in the overall patterns of means across successful and unsuccessful programs. These data should be considered with great caution since overall means are low and, in many cases, mean differences are very small. However, when isolating those characteristics most clearly related to the cognitive operations underlying creative problem-solving (i.e., cognitive generating factors and practical intelligence skills), successful leader interventions consistently yield higher means than unsuccessful interventions (20 KSAPs rated higher for successful programs; 5 KSAPs rated lower). Alternatively, ratings on the characteristics linked to social values, social skills, and human relations (i.e., commitment to social systems, need for dominance, and social intelligence), the corresponding pattern of mean differences is consistently in the opposite direction (2 KSAPs rated higher on successful programs; 16 rated lower). These data support the necessity of training social and personnel management skills in tandem with the cognitive skills also related to successful problem solving. Indeed, this conclusion was supported by Mumford, O'Connor, Clifton, Connelly, and Zaccaro's (1991) policy-capturing study. The inclusion of each additional set of leader KSAP constructs in a training program increased the predicted success of that program. Thus, programs that capture more of the proposed leader KSAPs are likely to be developmentally more effective than programs limited only to cognitive, motivational, personality, or social constructs.

The data from these analyses along with a review of the content of many human relations programs suggest that what is primarily inculcated in participants is generally a warm and considerate treatment of subordinates (note the relatively higher means for interpersonal sensitivity, empathy, and social adroitness). However, high level executives often need to ignore (or even bruise) individual sensitivities to promote their responsibility to the larger social system. Training programs that facilitate one-to-one or one-to-group human relations skills may to some extent inhibit such tendencies even when they are necessary for system advancement. In essence these programs foster service to the subordinate and neglect service to the organizational system as a whole.

Taken as a whole, these analyses of prior training programs indicate the necessity and utility of the leader development principles outlined earlier. In general, training efforts need to focus on the development of cognitive structures required to solve complex and ill-defined problems. Further, the content of training should vary according to the specific organizational roles being filled by trainees. Thus, unit leaders need to acquire basic cognitive and knowledge structures related to discrete problem-solving. Multi-unit leaders need to acquire the understanding and skills that result in effective multi-unit management. Training for subsystem leaders should emphasize skills related to complex problem-solving and long term planning. Finally, system leaders require the development of more complex boundary spanning skills and the acquisition of capabilities related to multisystem management. This suggests, then, that leadership training programs need to be more comprehensive, more integrated, and more focused on long term development than is typically evidenced in the prior training efforts reviewed here.

### **Hypotheses and Proposed Measurement System**

Thus far in this report we have presented a theoretical framework for understanding organizational leadership, described the relationships between KSAPs and leader effectiveness, and advanced a number of principles to explain leadership development and the influence of leaders' KSAPs over the course of an individual's career. Taken together, these theoretical systems provide a number of hypotheses for an extensive empirical investigation of leadership

Table 15. Illustrative Hypotheses for Leader KSAPs

KSAPs That Predict Leader Performance	Does the Importance Change as Leaders Progress? (+ or -)	Does the KSAP Facilitate or Hinder Development? (F or H)
<b>Cognitive Generating Factors</b>		
1. General Cognitive Intelligence		
A. Problem Anticipation	yes +	F
B. Inductive Reasoning	no	no
C. Deductive Reasoning	yes +	no
D. Time Sharing	yes +	F
2. Creativity		
A. Definition of Problem	yes +	F
B. Fluency	yes +	F
C. Originality	yes +	F
3. Crystallized Cognitive Skills		
A. Oral Comprehension	yes +	no
B. Written Comprehension	yes +	no
C. Oral Expression	no	no
D. Written Expression	no	no
E. Information Ordering	yes-	H
F. Selective Attention	yes +	F
G. Technical Ability	yes +	F
<b>Personality</b>		
1. Adaptability/Ego Resiliency		
A. Adaptability	yes +	F
B. Emotional Control	no	H
C. Self-Esteem	no	F
D. Risk Taking	yes +	F
E. Performance Motivation	no	F
F. Energy Level	no	F
G. Sensing	yes-	H
2. Openness/Curiosity		
A. Cognitive Complexity	yes +	no
B. Openness to Experience	yes +	F
C. Investigative	yes +	F
D. Tolerance for Ambiguity	yes +	F
E. Intuition	yes +	F
F. Thinking	yes +	F
G. Perception	yes +	F
3. Self-Awareness		
A. Internal Locus of Control	no	
B. Self-Appraisal	yes +	F
C. Tolerance for Failure	no	H
D. Discretion (Ego Control)	yes +	F

Table 15. Illustrative Hypotheses for Leader KSAPs (Continued)

KSAPs That Predict Leader Performance	Does the Importance Change as Leaders Progress? (+ or -)	Does the KSAP Facilitate or Hinder Development? (F or H)
<b>Values and Motives</b>		
1. Achievement		
A. Achievement	yes +	no
B. Self-Expression	yes +	F
C. Mastery Motives	yes +	F
D. Autonomy	yes +	F
2. Need for Dominance		
A. Need for Power	yes-	H
B. Political	yes +	no
C. Judgment	yes-	H
D. Enterprising	yes +	F
3. Commitment to Social Systems		
A. Responsibility	yes +	F
B. Social	yes-	no
C. Social Alienation (-)	yes-	H
D. Object Belief (-)	yes-	F
E. Coaching	yes-	F
<b>Embedded Appraisal and Implementation Skills</b>		
1. Practical Intelligence		
A. Monitoring Goal-Relevant Cues	no	F
B. Selection of Solution Components	no	F
C. Information Appraisal	yes +	no
D. Information Gathering and Encoding	yes +	F
E. Planning and Implementation	yes +	F
F. Evaluation of Discrepancy Importance	no	no
G. Monitoring Implementation and Solution Outcomes	yes-	F
H. Problem Sensitivity	yes +	F
I. Prioritizing	no	no
J. Implementation of Solution	yes-	no
K. Administrative Skill	yes-	F
2. Social Intelligence		
A. Interpersonal Sensitivity	no	H
B. Social Confidence	yes	F
C. Empathy	yes-	no
D. Wisdom	yes +	F
E. Feeling	yes-	H
F. Negotiation Skills	yes +	no
G. Social Adroitness	yes +	no
H. Adherence to Procedures	yes-	H
I. Norm Sensitivity (Social Conformity)	yes-	H

development. Many of these hypotheses were stated, along with their corresponding theoretical rationales, in the prior sections of this report. In this section, we will summarize these hypothesized relationships and present a measurement system for their testing. We emphasize that these are hypotheses and predictions that necessitate considerable empirical tests and assessments. Thus, we offer them as guides to future research activities.

### **Hypotheses: Leader KSAPs, Performance, and Career Development**

Table 15 presents the hypotheses that are indicated by the theoretical systems outlined in this report. Three research questions are addressed: (a) does a particular KSAP predict successful leadership in military organizations; (b) does the importance of the KSAP change as individuals proceed through organizational levels in the course of their careers; and (c) does the KSAP act directly to facilitate or inhibit the individual's career progress. The first column in Table 15 lists the 65 KSAPs we have proposed as determinants of leader development. The selection of each construct was based on its contribution to effective discretionary and creative problem solving across the different levels and roles of a leader's career. As argued earlier in this report, each of the KSAPs conditions one or more of the basic cognitive operations that underlie such problem-solving.

**Developmental-Related Changes in Importance of KSAPs:** Earlier we outlined a theoretical rationale for proposed changes in specific KSAPs as leaders ascend through organizational roles and career levels. These changes are based on four observations. First, the breadth, complexity, and abstractness of problems confronting leaders increase in higher organizational roles. This means that (a) the degree of individual discretion increases (Jacques, 1977; Jacobs & Jacques, 1989), and (b) problems become less well defined. Second, as they ascend organizational roles, leaders more often interact with and coordinate the actions of multiple subsystems under dynamic environmental conditions. Thus, multiple sources of information and phases of action are evident, requiring complex planning and coordination. A third observation is that the demands and personal sacrifices required of leaders increase significantly as they advance to more encompassing organizational positions, often without an immediate increase in personal rewards. This puts a premium on personal responsibility and achievement motives. Finally, the social demands on leaders change across organizational roles. At lower levels, leaders are more directly involved in subordinate development and operate under more clearly defined power configurations and lines of authority. In upper level positions, leaders coordinate multiple subsystems and experience less direct contact with lower level subordinates. Hence, the nature of social interactions change, along with the importance of particular KSAPs that shape the quality of these interactions.

The implications of these observations for the proposed KSAPs are summarized in the second column of Table 15. If a particular construct increases in importance over organizational role levels, then a "yes +" is indicated. If the proposed change is negative, where the KSAP becomes less important, a "yes -" is indicated. Finally, if the variable, is considered important for leadership across different roles and this importance does not change, then a "no" is placed in column 2.

Across organizational levels, three general cognitive intelligence variables, problem anticipation, deductive reasoning, and time sharing, are expected to increase in importance as determinants of effective leader performance. Increases in problem complexity and abstractness necessitate more of the cognitive operations conditioned by these characteristics. The importance of inductive reasoning, however, is not expected to change. Also increasing in criticality as performance determinants are the three KSAPs subsumed under creativity, and four of the crystallized cognitive skills, oral and written comprehension, selective attention, and

technical ability. The need to deal with multiple information sources across many organizational domains as well as the increasing requirements for novel or unique problem solutions place premiums on these qualities. Skills of oral and written expression are not expected to change in predictive importance. However, one skill related to direct administration and more concrete problem situations, information ordering, decreases in importance as leaders ascend organizational levels.

As indicated earlier, subsystem and system leaders experience less buffering from the external environment than lower level leaders, resulting in progressively more uncertainty, ambiguity, and variability. This suggests that two of the variables under the first personality dimension, adaptability and risk-taking, increase in their influence as determinants of leader effectiveness. Four variables, emotional control, self-esteem, performance motivation, and energy level, are considered to be similarly important across organizational roles. One construct, however, is considered to decline in importance. The characteristics of the problem-solving environment confronting subsystem and, more saliently, system leaders also requires a great tolerance for ambiguity as well as intellectual curiosity. Accordingly, all of the variables subsumed under the openness/curiosity personality subdimension are proposed as increasing in their predictiveness of leader performance at higher organizational levels. Similarly, self-monitoring and ego control (discretion) also assume greater importance at these levels; the influence of locus of control and tolerance for failure is expected to be constant across leadership roles.

As we noted, high level leaders are expected to commit significant personal resources to organizational goal attainment, often with little immediate gain. Also, activities involving subordinate development and administrative activities are expected to decline significantly in frequency of occurrence. Accordingly, the critical values and motives for high level leaders (as opposed to lower-level roles) are political and enterprising values, a strong sense of responsibility for the systems's welfare, and the four individual qualities characterizing a strong achievement orientation. Further, the lack of social alienation and object beliefs becomes more critical at upper levels as leaders assume responsibility for greater parts of the organizational system. Individual qualities that decline in their predictive importance across leadership roles include need for power, judgement, social and coaching values.

Embedded skills emphasize the appraisal of information and the implementation of problem solutions. At more encompassing organizational roles, leaders spend more time encoding information, building declarative and procedural knowledge structures, and generating problem solutions. Also, interpersonal requirements at these levels reflect system coordination, conflict resolution, and long range subsystem growth. Actual solution implementation and direct subordinate contact decline in frequency as components of leader role behaviors. These observations suggest that practical intelligence skills related to information management and solution generation (i.e., information appraisal, information gathering and encoding, planning, and problem sensitivity) will become more important at the subsystem and system levels of leadership. Skills that are related to solution implementation and administration (i.e., monitoring implementation and solution outcomes, solution implementation, and administrative skills) decline in relative importance. Four practical intelligence skills, monitoring goal relevant cues, selection of solution components, evaluation of discrepancy importance, and prioritizing have similar importance across leadership roles.

Social intelligence skills, that condition direct interpersonal management and administration, decline in their relative prediction of performance as leaders ascend organizational roles. These skills include empathy, feeling, adherence to procedures, and norm sensitivity. Alternatively, skills, such as wisdom, social confidence, negotiation skills, and social

adroitness which are related to the coordination of subsystems and whole system management, increase in importance. Interpersonal sensitivity is a relatively constant determinant of leader effectiveness across organizational roles.

**Developmental Facilitators:** As noted earlier, several personal characteristics are particularly important, not only because they condition successful high level leadership, but also because they promote successful developmental efforts. Specifically, these capacities facilitate the acquisition of discrete skills and knowledge needed for one's career development. Indeed, their most critical impacts occur at role transition phases, when the emerging leader acquires expanded role demands involving more abstract organizational problems. Of major importance are those characteristics that promote cognitive flexibility, the ability to deal with increasingly abstract events, an openness to challenge, and skills to generate and implement problem solutions in relatively novel roles. The third column in Table 15 indicates predictions regarding the role of each KSAP as a developmental facilitator. If the particular construct facilitates developmental progress, then a "F" is indicated; if the construct actually inhibits progress (such as those that may condition cognitive and behavioral inflexibility) then an "H" is noted. When the construct is assumed to have no effect on developmental progress through career levels, then a "no" is indicated.

Regarding cognitive generating factors, problem anticipation, time sharing, selective attention, technical ability, and all of the creativity factors facilitate developmental progress. These personal characteristics promote skill acquisition under conditions of information complexity and high information load. On the other hand, high levels of information ordering skills are felt to hinder career development. The remaining cognitive capacities (i.e., inductive and deductive reasoning, oral and written comprehension, and oral and written expression) are not expected to have significant developmental effects.

To facilitate leaders' progress through role transition phases, attributes that promote adaptation, achievement-striving, intellectual openness, and cognitive flexibility are highly desirable. Accordingly, the personality variables that are proposed as development spurs include adaptability, self-esteem, risk-taking, energy level, performance motivation, self appraisal, discretion, and all of the openness/curiosity variables except cognitive complexity. Those personality constructs hindering development are emotional control, tolerance for failure, and a preference for acquiring information through sensing functions. Among the value and motive variables, self expression, autonomy, mastery motives, responsibility, object belief, and values reflecting a preference for enterprising and coaching activities are all proposed as facilitating career development. Need for power, judgement, and social alienation are felt to inhibit organizational role transition. Achievement, political, and social values are not expected to affect developmental progress.

Embedded appraisal and implementation skills should facilitate leader development by helping such individuals cope with novel and shifting role expectations. Accordingly, all of the practical intelligence skills, except information appraisal, prioritizing, solution implementation and evaluation of discrepancy information are considered as developmental facilitators. However, some of the skills linked to social intelligence can be expected to inhibit career development by making it difficult for leaders to focus more on social system management and less on individual subordinates or units, as their higher level positions require. These skills include interpersonal sensitivity, feeling, social adroitness, adherence to procedures, and norm sensitivity. Social confidence and wisdom are proposed as developmental spurs while empathy and negotiation skills are not expected to have any effects on career progress.

## **Proposed Measurement System**

In this section a measurement system to be used to assess potential leaders' attributes, knowledge, and experiences is proposed. Three types of instruments will be utilized: standardized psychometric measures, background or life history measures, and specially designed tests of the meta-cognitive processes involved in creative problem solving.

The standard psychometric measures which assess a person's absolute possession of the 11 core constructs were described earlier (Mumford & Owens, 1987). The instruments selected have been used extensively in a variety of situations and have excellent psychometric properties.

The background data or life history measures assess typical actions in real-life situations and are grounded in the understanding that people's behaviors do not arise in a vacuum, but instead are shaped or conditioned by prior behavior and experiences. This is not to say that people necessarily behave in the future precisely as they have in the past or that background data items are sensitive solely to the issues of nurture. Instead this assumption implies that prior learning and heredity, along with the environmental circumstances in which they express themselves, make some patterns of behavior more likely to occur in new situations.

The format of typical background data measures involves presenting individuals with questions about their behaviors and experiences in relatively discrete situations likely to have occurred earlier in their lives (Mumford & Owens, 1982; 1987). Thus a typical item might ask, "How many books have you read in the past year?" In responding to these questions, respondents are asked to recall their typical behavior patterns in the referent situations and select the response option that most closely describes these prior behaviors and experiences. Items are then clustered in terms of their common reflection of performance-relevant KSAPs. Background data items developed and used in this manner possess a number of advantages (Mumford & Stokes, in press). First, much descriptive information can be obtained using a relatively economical paper and pencil format (Mumford & Owens, 1987; Owens, 1976). Second, people's responses to these items are reasonably resistant to faking and the more common psychometric biases when appropriate item construction procedures are employed (Klein & Owens, 1965; Shaffer, Saunders, & Owens, 1986). Third, the evidence compiled by Asher (1972), Ghiselli (1973), Hunter and Hunter (1984), Owens (1976), and Reilly and Chao (1982) indicate that empirically keyed background data scales are effective predictors of many different criteria, with typical cross-validities in the .30 to .40 range. Indeed, significant evidence from a variety of business, cultural, and military settings has accrued indicating that background data scales can predict leadership performance (e.g., Laurent, 1962, 1970; Hinrichs, Haanpera, & Sonkin, 1976; Morrison & Sebold, 1974; Richardson, Bellow, & Henry, 1984; Rothstein, Schmidt, Erwin, Owens, & Sparks, 1990; Russell, 1990; Russell, Mattson, Devlin, & Atwater, 1990; Stricker, 1989).

Two general forms of background data instruments are included in this measurement system. The first instrument is designed to tap the leader KSAPs described earlier. The items selected for this measure come from an item pool developed to assess each of the eleven core KSAP dimensions and their subordinate constructs. These items have been developed with reference to prior behaviors and experiences in the work place and, accordingly, are likely to provide especially sensitive indicators of construct application in real life situations. Examples of three background data items for each of the proposed 65 KSAPs are presented in Appendix D-1. The second background data instrument is designed to focus more specifically on significant experiences that bear upon career development. The items on this instrument were expressly developed for the present effort; their content refers to behaviors, events and experiences (e.g., exposure to role models, quality of peer and subordinate contacts, number of

self-selected educational and developmental opportunities) that are proposed as significant determinants of successful career development. Two psychologists with extensive experience in developing background data measures constructed each of the items, using information provided in the career development literature (Hall, 1986; Vondracek, Lerner, & Schulenberg, 1986) and through interviews with military officers at different career and organizational role levels. Five other psychologists and graduate students then reviewed the content and wording of each item. The final pool of items is presented in Appendix D-2.

The final set of instruments in this measurement system includes a number of tests designed to assess creative problem solving, its attendant meta-cognitive processes, and corresponding knowledge structures across a range of ill-defined leadership tasks and problem scenarios. This instrument set also contains an inventory of environmental characteristics and moderators that pose specific challenges and problems to leaders at various points in their career. These instruments were developed specifically as part of this research effort and are designed to assess embedded appraisal and implementation skills, the content and structure of a leader's specific knowledge, leadership effectiveness, and environmental influences on these processes. These measures are presented in Appendix E.

A description of the standard psychometric tests and, if applicable, the problem-solving tasks that correspond to each of the eleven core dimensions of the proposed leader KSAP taxonomy is presented below as well as measures of environmental factors and career experiences that condition relationships in the proposed model. All of the measures in the measurement system are listed in Table 16.

**Cognitive Generating Factors:** The capacities listed as cognitive generating factors are assessed using background data items from the pool presented in Appendix D-1. General cognitive intelligence is also to be measured through Terman's Concept Mastery test (Terman & Oden, 1947; 1959) which measures meta-cognitive processes and skills involving the manipulation of abstract concepts and ideas as well as the complexity and interrelatedness of conceptual categories possessed by the individual. The Concept Mastery test consists of two parts, a synonym-antonym test and an analogies test and has strong reliability and validity (Terman & Olden, 1959).

Creativity is assessed by Guilford's Consequences test (Guilford, 1967; Guilford & Hoepfner, 1971). This test assesses both ideational fluency and originality as components of divergent thinking skills. Individuals are asked to indicate the "effects of a new and unusual event" (e.g., "people no longer need or want sleep"; Guilford & Hoepfner, 1971, p. 385). The frequency of "obvious" responses is considered an index of fluency while the frequency of remotely associated or unique responses measures originality. Evidence from a number of studies indicates moderate to strong reliabilities and validity coefficients (Fredericksen & Evans, 1974; Guilford & Guilford, 1980; Hinton, 1968).

Crystallized cognitive skills are assessed using Guilford's Alternate Headlines test (Guilford & Hoepfner, 1971). Individuals are asked to rewrite headlines by substituting different words and producing an alternate version having the same meaning. This test measures verbal fluency skills as components of creative planning abilities. Evidence of reliability and validity is provided by Guilford and Hoepfner (1971).

**Personality Constructs:** The 18 personality variables postulated in the taxonomy are each measured by three of the background data items presented in Appendix D-1. The dimensions of adaptability/ego resiliency and self-awareness are also assessed using Block's California Q-set (CQ; Block, 1971). This test involves having judges evaluate a subject by



**Table 16. Proposed Measures**

<b>Construct</b>	<b>Measure</b>
General Cognitive Capacity	Background Data Concept Mastery
Creative Problem Solving Capacity	Background Data Consequences A
Crystallized Cognitive Capacity	Background Data Guilford Alternate Headlines
Adaptability	Background Data Block Ego Resiliency Test MBTI
Openness	Background Data NEO-PI: Openness Scale MBTI
Self-Awareness	Background Data Block Ego Control Test
Achievement	Background Data Jackson Research Form - Achievement Scale
Dominance/Need for Power	Background Data Jackson Research Form - Dominance Scale MBTI
Commitment to Social Systems	Background Data CPI Responsibility Scale
Appraisal Skills	Background Data Think-Out-Loud Task Leadership Intelligence Test
Knowledge	Task Sort
Career Development Experiences	Background Data Officer Experience Questionnaire
Environmental Moderators	Environmental Moderators Questionnaire
Problem Solving	Creative Problem Solving Tasks
Performance	Peer Ratings Trainer Ratings Critical Incidents

sorting a series of descriptions into categories ranging from most "characteristic" to most "uncharacteristic" of the target person. Block (1971) defines the Q-sort procedure as "a set of mildly technical rules for the scaling of a group of personality-descriptive variables (Q items) vis-a-vis a particular individual so that the ultimate ordering of the Q-items expresses well the judge's formulation of the personality of the individual being evaluated" (p. 37). This procedure has been used to measure both ego resiliency and ego-control and has evidenced strong reliability and validity (Block, 1971; Funder & Block, 1989; Funder, Block, & Block, 1983).

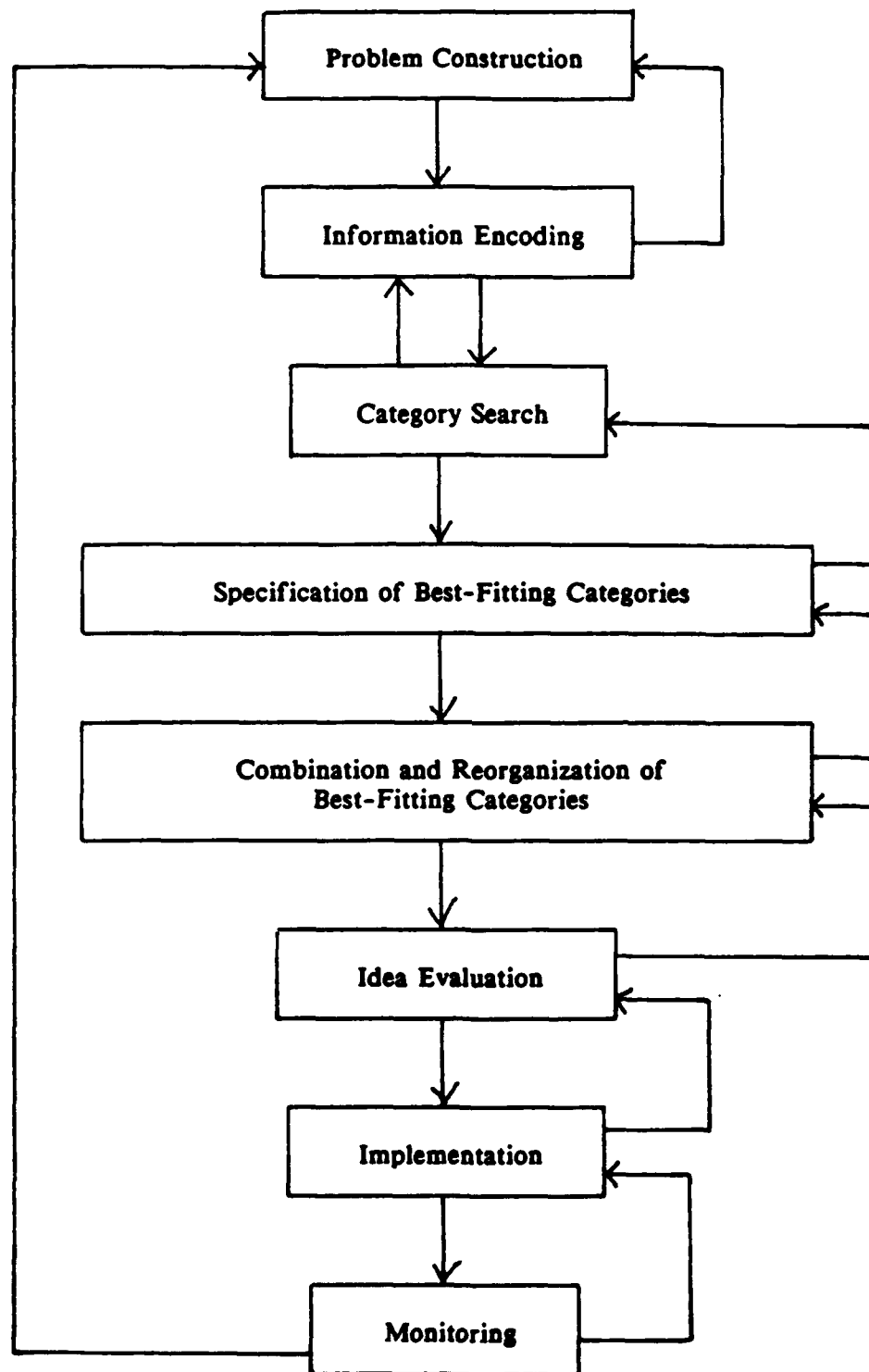
Openness/curiosity is assessed using the openness to experience subscales from Costa and McCrae's NEO Personality Inventory (NEO-PI; Costa & McCrae, 1980; 1985; McCrae & Costa, 1987; 1991). Individuals rate themselves on scales anchored by antonymous characteristics (e.g., unadventurous-daring; uncurious-curious). Psychometric evidence indicates that this test has acceptable reliability and validity (Costa & McCrae, 1988; McCrae & Costa, 1983; 1987; 1991).

The intuition, thinking, and perception constructs of the openness/curiosity personality dimension in the KSAP taxonomy as well as one adaptability/ego resiliency factor (i.e., sensing) are assessed by the Myers-Briggs Type Indicator (MBTI). This measure examines the preferences people have in acquiring information, making decisions, and orienting themselves vis-a-vis the outer world (Myers, 1987). In the MBTI, individuals respond to a number of forced choice items by indicating their preference for specific actions and personal descriptions. Myers and McCaulley (1985) provide evidence for the MBTI's reliability and validity.

**Values and Motives:** Background data items for the constructs subsumed under this dimension are presented in Appendix D-1. Achievement and dominance values are also assessed using subscales from the Jackson Personality Research Form (Jackson, 1984). Studies have demonstrated strong reliability and validity for these subscales (e.g., Anastasi, 1982; Jackson, 1984; Jackson & Helmes, 1979). An individual's orientation of judgement toward others is also measured using the MBTI.

Values and motives related to commitment to social systems are assessed using the Gough's responsibility subscale of the California Psychological Inventory (CPI; Gough, 1975; 1987). Individuals taking this test indicate their agreement or disagreement (i.e., "true" or "false") with self-descriptive statements. Psychometric evidence for this scale is presented by Gough (1975; 1987).

**Embedded Appraisal Skills:** As with the other constructs in the leader KSAP taxonomy, the 20 appraisal and implementation skills linked to practical and social intelligence are assessed with background data items that are presented in Appendix D-1. Also, two other measures designed to assess complex cognitive skills as they are applied in more discrete problem situations were constructed. The first measure is a think-out-loud protocol in which respondents are presented with three complex, ill-defined leadership problems. They are then asked to write out brief responses to a series of question that tap the cognitive operations involved in creative problem-solving. Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares (1991) argued that such operations should be specified in relation to the requirements for generating new problem solutions using available categorical knowledge structures. In accordance with Koestler (1964), Kuhn (1970), Owens (1969), and Rothenberg (1986, 1988), they argued that creativity requires the combination and reorganization of extant categories to generate new ideas or problem solutions. The application of this principle led to the identification of eight processes. Figure 5 presents a schematic overview of the nature of these processes and their proposed relationships. The questions on the think-out-loud protocol were constructed to assess each one of these steps in the creative problem-solving process. Further, because these steps are embedded within a



**Figure 5. Hypothesized Relationships Among Core Creative Processes**

specific leadership context, they provide a potentially strong index of the appraisal and implementation skills included in the leader KSAP taxonomy. The principles identified by Mumford et al. (1991) will be used to construct rating scales for evaluating the apparent effectiveness with which people apply each step of the creative problem solving process in their respective answers. After the reliability and validity of these ratings have been established, scores on each process will be obtained by summing the raters' evaluations across the questions targeting a given process. An example of the Think-Out-Loud Creative Problem Solving Inventory is presented in Appendix E-1.

Practical social problem-solving skills are also measured through a leadership intelligence test. This test consists of a series of discrete problem vignettes in which respondents are asked to select from among several sets of choices the best course of action in each set. The scenarios were developed from an extensive review of managerial critical incidents. Specific scenarios were selected to reflect one or more of the leader behavior dimensions in the Leader Performance Taxonomy (see Table 1; Figure 2). The choices of actions in each set were also based on the LBDs. However, because a problem scenario taps a particular domain (e.g., possible long term shortage of critical materials), the best action plans are those that reflect corresponding leader behaviors (e.g., acquiring new suppliers). Given that these items contain discrete problem scenarios that involve information acquisition and appraisal, problem construction, planning, and/or solution implementation within a variety of social settings, they are designed to be strong measures of practical and social intelligence within leadership domains. The Leadership Intelligence test is presented in Appendix E-2.

**Leader Knowledge:** Well-developed embedded appraisal and implementation skills can be expected to produce in an individual more complex knowledge structures regarding leadership and leadership tasks. To assess this prediction, a Q-sort of executive/leader task statements was developed. Respondents are asked to sort 100 cards on which leadership tasks are written into discrete categories. Four different sorts are made. In the first sort, the directions require that the task statements be grouped into categories based on similarity of task activities. No other directions are given. Respondents are free to choose as many or as few categories as they wish and to use whatever schema they desire. Afterwards, they write a brief definition of each of the established categories. The second sort occurs after the tasks are identified as leadership tasks; again participants categorize the behavior statements and write a definition of the established categories. The last two sorts require that participants adopt the role of a first lieutenant and a major general, respectively, and rearrange the tasks into categories as each respective officer would if given the same assignment. As before, these categories will then be labeled. These sorts are then scored using one or more of the following protocols: (a) similarity of the sort to the dimensions in the taxonomy of leadership behaviors; (b) similarity of the sort to those typical of individuals at each position in the organizational role sequence; (c) similarity of the sort to those provided by lieutenants and generals, respectively; (d) discrepancies in an individual's sort from those typical of individuals at his/her role position; and (e) perceived category breadth, complexity, and organization. These ratings of structural quality are made by five judges on specially developed rating scales derived using Hennessey and Amabile's (1988) consensual rating technique (Redmond, Mumford, & Teach, in press). Similarity evaluations are based on the frequency overlap in category labels and task assignments. In sum, these sorts are meant to assess the content, complexity, and development of an individual's knowledge structures regarding leadership and leadership tasks. The specific tasks to be sorted with the corresponding instructional sets are shown in Appendix E-3.

**Environmental Moderators:** A instrument was developed to assess the degree to which a range of environmental conditions influence leadership behaviors (see Table 10 for a listing of these moderators). Participants were asked to consider events related to the nature of (a) the

army as a whole, (b) the unit, (c) the soldier or subordinates, (d) the tasks assigned to subordinates, (e) the leader's position, (f) resources, and (h) combat and noncombat conditions. Specifically, respondents are asked to indicate the degree to which they can control the influence of a particular moderator, the amount of effort that is expended in controlling the moderator, and the degree to which it limits their performance as a leader. It is expected that responses to these scales will vary according to both position within the organizational role structure and the strength of leadership KSAPs possessed by the individual respondent. The Environmental Moderators Instrument is presented in Appendix E-4.

**Career Experiences:** As noted, the content and extent of an individual's career experiences should condition the quality of leadership characteristics and the effectiveness of leadership performance. Two instruments have been developed to assess career experiences. The first is the background data instrument described earlier and which is presented in Appendix D-2. The second instrument is the Officer Experience Questionnaire, which requests information from respondents about how previous duty assignments facilitated their development as leaders. This questionnaire, shown in Appendix E-5, was constructed on the basis of reviews of the career development literature (Hall, 1986) and from interviews with military officers at different career levels. In the first section of the questionnaire, respondents are asked to indicate the duty assignments within the last five years that were most and least helpful to their development. They also describe the characteristics of the assignment that made it helpful (or not helpful), the nature of the problems they confronted, the solutions they generated, and where or how they learned the skills or knowledge needed to handle such problems. In the case of assignments that did not facilitate development, respondents are asked to indicate what could have made the assignment more helpful.

In the second part of the survey, respondents answered a series of questions based on *the dimensions in the taxonomy of leadership behavior*. For each of the thirteen behavioral dimension (e.g., acquiring information), individuals are asked to describe the duty assignment in which they learned the most about performing such activities, the experiences that most enhanced skills needed to perform such activities, and the assignments that required the most and least amount of the particular activities. This part of the instrument is particularly useful because it focuses attention on the career experiences that were most salient in the development of critical leadership functions. Responses on these questions can also highlight strength and weaknesses possessed by respondents in terms of the development of these behavior patterns. The responses provided by the participants will be content-coded using criteria derived from analyses of the career development literature (e.g., career challenge, occupational fit, personal investment in developmental events).

**Measures of Problem Solving and Leadership Performance:** Several measures are proposed as criteria for validating the proposed predictive influences of leader KSAPs, environmental events, and career experiences on leader effectiveness. The first of these measures is the Creative Problem-solving Test. Given that effective leadership is defined as high quality creative problem-solving in ill-defined domains, an essential criterion is the assessment of such performance. Accordingly, individuals are presented with four novel, albeit realistic, military leadership problems and asked to provide a written description of how they would solve the problem. The problems were selected to represent one of the four superordinate dimensions in the leadership taxonomy. Thus, each problem emphasized either information acquisition, planning and coordination, personnel management, or material handling. These problems are illustrated in Appendix E-6. For each problem, respondents were asked to indicate in detail their specific plan of action and how they would implement and monitor their solutions. They were also asked to indicate clearly the logic and rationale behind their recommended actions. Performance is assessed by having judges rate the written solutions

using specially developed benchmark rating scales (Redmond, Mumford, & Teach, in press). These scales will target (a) quality, (b) originality, (c) degree of discretion manifested in the solution, (d) degree of abstraction manifested in the solution, (e) sensitivity to environmental constraints, and (f) coordination of multiple resources and action paths.

The second criterion measure is based on respondents' self-reports of experiences and critical incidents describing successful application of a particular leadership function. Subjects are asked to provide descriptions of critical incidents for each one of the superordinate dimensions of the taxonomy of leadership behavior. Further, they are asked to describe critical performance situations under both garrison and combat situations. In their statements, respondents will be required to state such aspects of each situation as the general circumstances, events leading up to the situations, actions that were taken, and consequences of these actions. These incident descriptions will then be evaluated using a variation on the behavioral consistency rating approach (Hough, 1984). Thus, evaluation scales will be developed having specific leader accomplishments defining scale points and anchors. Application of this technique will yield seven-point performance ratings based on illustrations of maximum performance in "real-world" settings, thereby providing an important supplement to the performance appraisals obtained in training. Instructions for the critical incidents measures are shown in Appendix E-7.

It is expected that several aforementioned surveys and instruments will be administered during officer training sessions. Accordingly, the third set of criterion measures involves performance appraisal ratings by peers and trainers. In the peer ratings, respondents indicate the five individuals (excluding the rater) from their training class that would be the most effective leaders. Nominations are to be ranked in order of descending effectiveness. Then, peers indicate the five most effective individuals in the training class in terms of the four superordinate dimensions of the leadership taxonomy. Respondents receive a description of the dimension and its corresponding subdimensions. They then indicate in descending order the individuals most effective in completing the specific behaviors in each dimension. This particular assessment strategy was chosen in part because peer evaluations have been shown to yield the most valid assessments of performance, and in part because peer evaluations collected in training do not induce reactance (Mumford, 1983). Peer evaluation forms are illustrated in Appendix E-8.

The trainer ratings are indicated on a general cross-role performance appraisal instrument. To construct this instrument, the 13 subdimensions of the leadership taxonomy will be used to define rating dimensions. Subsequently, behavioral definitions of each dimension will be formulated using illustrative tasks. At the end of training, primary instructors will be asked to rate, on a seven-point scale, all members of a class group on each dimension. Trainers are asked to consider their observations of trainee performance throughout the course. Instructors will be asked to rate the best member of the class, first using no more than one rating below 3, and then the worst members of the class using no more than one rating above 6. This manipulation is intended to specify the bounds of ratings and force instructors to differentiate among trainees without forcing a specific distribution.

Taken together these criteria are expected to provide an effective index of both potential and actual leadership performance. We note that the combinational use of these criteria would necessarily entail the determination of their convergent and divergent validity. However, these measures allow a strong test of the predictive validity of the theoretical system proposed in this

report. Figure 6 summarizes this theoretical system along with its corresponding measurement system.

### Summary

A number of sources have documented deficiencies in leader development programs, across a variety of organizational settings and specifically in the Army (Campbell et al., 1970; Fleishman, et al. 1955; Jacobs & Jacques, 1989). Given prior research suggesting that effective application of available cognitive capacities represents a crucial determinant of high-level organizational leadership, the formation and enhancement of these capacities and their attendant qualities should be the focus of leader development interventions. This report provides the infrastructure required for programmatic interventions targeting the development of these capacities.

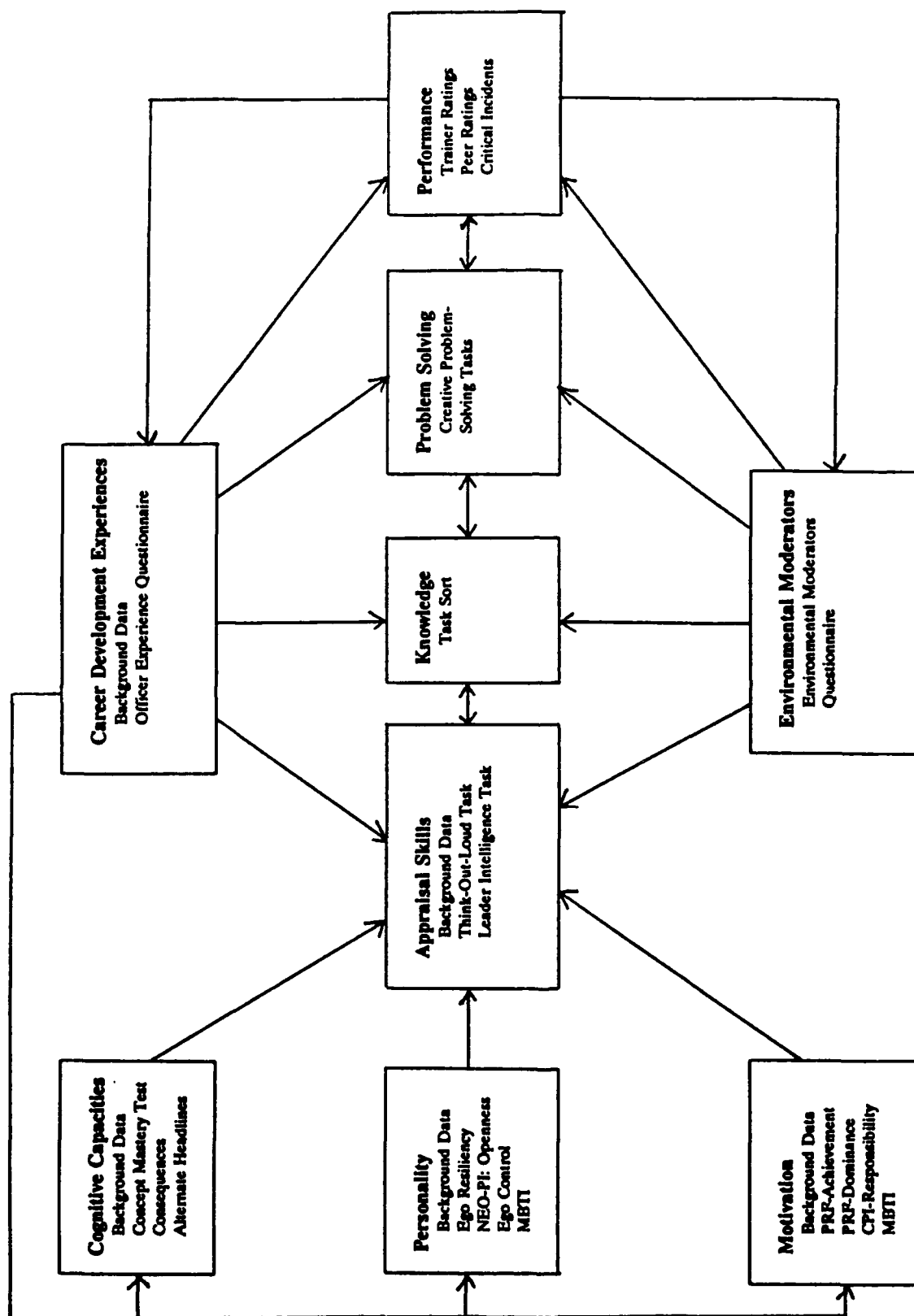
This infrastructure is grounded in the perspective of functional leadership, where the role of leaders is to specify and advance organizational goals and to facilitate the organization's product transformation process. The actions of leaders often occur in variable and dynamic environmental conditions, where the nature of goal blockages are often ambiguous. Thus, organizational leadership is viewed as discretionary problem-solving in ill-defined domains. Because problem situations often require novel solutions, their solution also necessitates creative input. Accordingly, a taxonomy of leadership was identified which had four superordinate categories: Information Use and Structuring, Information Use in Problem-solving, Managing Personnel Resources, and Managing Material Resources. This taxonomy and the corresponding definition of high-level leadership action as creative problem-solving was used to identify 65 cognitive and temperament predictors of executive ability. These KSAPs were organized into 11 dimensions -- general cognitive intelligence, creativity, crystallized cognitive skills, adaptability/ego resiliency, openness/curiosity, self awareness, achievement, need for dominance, commitment to social systems, practical intelligence and social intelligence. A model was also proposed which specified the interrelationships among these dimensions and with leader problem-solving and performance. Preliminary tests supported the validity of both the leadership and KSAP taxonomy.

The recommendations for leadership development that emerge from these theoretical systems vary according to a leader's level within an organization. As leaders progress through these levels in the course their careers, the nature of their leadership roles change. Problems increase in breadth and complexity; thus, their resolution requires well-developed and more organized knowledge structures. Also, because these problems become more variable and ill-defined, leaders spend an increasing proportion of their time on information acquisition and problem structuring activities and less on direct administration and subordinate development. Finally, as leaders increase the breadth of their responsibility from single or core organizational units, to multiunits, to subsystems and systems, the social dynamics of their role and attendant forms of interaction also change. These proposed shifts in the nature of leadership roles across organizational levels suggest progressive shifts in the differential characteristics required for effective performance. Thus, as leaders ascend role positions, the KSAPs that become more important include complex appraisal skills, meta-cognitive and creative capacities, self-resiliency, openness and intellectual flexibility, achievement values, commitment to the organization as a whole, and practical and social intelligence factors related to problem-solving. Accordingly, the development of organizational leaders should focus on the formation and enhancement of skills that are operative at lower role positions and subsequently the steady refinement and elaboration of these capacities for success in increasingly broader role positions.

This report follows with a review of hypotheses that are suggested by the theoretical systems outlined in this report and a corresponding measurement system for their test. This system incorporates three types of measures, standard psychometric tests, background data or life history measures, and problem-solving tasks that include both discrete and broadly-defined leadership scenarios. This measurement system also contains ratings of leadership performance and effectiveness. It is expected that this measurement system will provide a valid and sufficient test of the leader KSAP model proposed herein.

To conclude, the leadership literature has suffered from a sense of inadequacy and deficiency in describing both the differential characteristics underlying effective organizational leadership and the development of identifiable characteristics. In a bid to ameliorate this situation, the present report offers several integrated theoretical systems. It is expected that their application should facilitate an understanding of individual factors that determine effective Army leadership at multiple levels. Further, these systems should foster principles for the systematic development of Army officers as they progress through their careers.





## REFERENCES

- Abbey, A., & Dickson, J. W. (1983). R&D climate and innovation in semiconductors. Academy of Management Journal, 26, 362-368.
- Ables, R. P., Steel, L., & Wise, L. L. (1982). Patterns and implications of life course organization: Studies from project talent. In P. B. Baltes & O. G. Brim, Jr. (Eds.), Life span development and behavior. New York: Academic Press.
- Ackerman, P. O. (1986). Individual differences in information processing: An investigation of intellectual abilities and task performance during practice. Intelligence, 10, 101-39.
- Ackerman, P. O. (1987). Individual differences in skill learning: An integration of psychometric and information processing perspectives. Psychological Bulletin, 102, 5-27.
- Albaum, G. (1976). Selecting specialized creators: The independent innovation. Psychological Reports, 37, 175-179.
- Albaum, G., & Baker, K. (1977). Cross-validation of a creativity scale for the Adjective Check List. Educational and Psychological Measurement, 37, 1057-1061.
- Albert, R. S. (1975). Toward a behavioral definition of genius. American Psychologist, 30, 140-151.
- Alexander, P. A., White, C. S., Hanesly, P. A., & Jeaner, M. (1986). Analogy training: A developmental study of effects on verbal reasoning. Journal of Educational Research, 80, 77-88.
- Allport, G. W., Vernon, P. E., & Lindzey, G. (1960). A study of values. Boston, MA: Houghton Mifflin.
- Amabile, T. M. (1983). The special psychology of creativity. New York: Springer-Verlag.
- Anastasi, A. (1982). Psychological Testing (5th ed.). New York: Macmillan.
- Anderson, J. R. (1985). Cognitive psychology and its implications. New York: W. H. Freeman.
- Andrews, F. M. (1975). Social and psychological factors that influence the creative process. In I. A. Taylor & J. W. Getzels (Eds.), Perspective in creativity (pp. 117-145). Chicago, IL: Aldine.

- Asher, E. J. (1972). The biographical item: Can it be improved? Personnel Psychology, 25, 251-269.
- Baer, J. M. (1988). Long-term effects of creativity training with middle school students. Journal of Early Adolescence, 8, 183-193.
- Ball, R. S. (1933). Predictability of occupational level from intelligence. Journal of Consulting Psychology, 2, 184-186.
- Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1989). Human agency in social cognitive theory. American Psychologist, 44, 1175-1184.
- Baron, R. M. (1981). Social knowing from an ecological event perspective: A consideration of the relative domains of power for cognitive and perceptual modes of knowing. In J. Harvey (Ed.), Cognitive social behavior and the environment. Hillsdale, NJ: Erlbaum.
- Baron, R. M., & Boudreau, L. A. (1987). An ecological perspective on integrating personality and social psychology. Journal of Personality and Social Psychology, 53, 1222-1228.
- Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality (pp. 439-470). Annual Review of Psychology. Palo Alto, CA: Annual Review.
- Barsalou, L. W. (1982). Context independent and context dependent information in concepts. Memory and Cognition, 10, 82-93.
- Barsalou, L. W. (1983). Ad hoc categories. Memory and Cognition, 11, 211-227.
- Barsalou, L. W. (1988). The content and organization of autobiographical memories. In V. Neisser & E. Winograd (Eds.), Remembering reconsidered: Ecological and traditional approaches to the study of memory.
- Barsalou, L. W. (1989). Intra-concept similarity and its implications on interconcept similarity. In S. Vosmadow & A. Ortney (Eds.), Similarity and analogical reasoning (pp. 76-121). New York: Cambridge University Press.
- Bass, B. M. (1960). Leadership, psychology, and organizational behavior. New York: Harper.
- Bass, B. M. (1981). Stogdill's handbook of leadership. New York: Free Press.

- Bass, B. M. (1985). Leadership--Good, better, best. Organizational Dynamics, 13, 28-40.
- Bass, B. M. (1990). Bass & Stogdill's handbook of leadership: Theory, research, and managerial application (3rd ed.). New York: Free Press.
- Bayley, N. (1968). Behavior correlates of mental growth: Birth to 36 years. American Psychologist, 23, 1-17.
- Beal, C. R., Garrod, A. C., & Bonitatibus, G. J. (1990). Fostering children's revision skills through training in comprehension monitoring. Journal of Educational Psychology, 82(2), 275-280.
- Bell, G. B., & Hall, H. G. (1954). The relationship between leadership and empathy. Journal of Abnormal and Social Psychology, 49, 156-157.
- Bennis, W. G., & Nanus, B. (1985). Leaders: The strategies for taking charge. New York: Harper & Row.
- Bird, C. (1940). Social psychology. New York: Appleton-Century-Crofts.
- Blades, J. E., & Fiedler, F. E. (1973). Participative management, member intelligence, and group performance (Tech. Rep. No. 73-40). Seattle, WA: University of Washington, Organizational Research.
- Block, J. (1971). Lives through time. Berkeley, CA: Barcroft.
- Boyatzis, R. R. (1982). The competent manager: A model for effective performance. New York: Wiley.
- Brandstater, J. (1989). Personal self-regulation of development: Cross sequential analyses of development-related control beliefs and emotions. Developmental Psychology, 25, 96-108.
- Bray, D. W., Campbell, R. S., & Grant, D. L. (1974). Formative years in business. New York: Wiley.
- Briskman, L. (1980). Creative product and creative process in science and art. Inquiry, 23, 83-106.
- Bromage, B. K., & Mayer, R. E. (1986). Quantitative and qualitative effects of repetition on learning from technical text. Journal of Education Psychology, 78, 271-278.
- Brown, A. L., & Campione, J. C. (1986). Psychology theory and the study of learning disabilities. American Psychologist, 41, 1059-1068.

- Brown, J. A., & Howerth, E. (1977). A comprehensive factor analysis of personality questionnaire items: A test of putative factor hypotheses. Multivariate Behavioral Research, 12, 339-427.
- Bryan, R. F. (1980). Skippers and strategies: Leadership and innovation in Shetland fishing areas. Human Organization, 39, 227-241.
- Bureau of Public Personnel Administration. (1930). Partially standardized tests of social intelligence. Public Personnel Studies, 8, 73-79.
- Burke, M. J., & Day, R. R. (1986). A cumulative study of the effectiveness of managerial training. Journal of Applied Psychology, 71, 242-245.
- Burns, J. M. (1978). Leadership. New York: Harper & Row.
- Burns, T., & Stalker, G. M. (1961). The management of innovation. Chicago: Quadrangle Books.
- Buss, A. H. (1989). Personality as traits. American Psychologist, 44, 1378-1388.
- Busse, T. V., & Mansfield, R. S. (1980). Theories of the creative process: A review and a perspective. Journal of Creative Behavior, 14, 91-103.
- Campbell, D. P., Borgen, F. H., Eastes, S. H., Johansson, C. B., & Peterson, R. A. (1968). A set of basic interest scales for the Strong Vocational Interest Blank for men. Journal of Applied Psychology Monograph, 52(no. 6, part 2), 1-54.
- Campbell, J. P., Dunnette, M. D., Lawler, E. E., & Wieck, K. E. (1970). Managerial behavior, performance, and effectiveness. New York: McGraw-Hill.
- Cantor, N., & Kilhstrom, J. F. (1987). Personality and social intelligence. Englewood Cliffs, NJ: Prentice-Hall.
- Cantor, N., & Mischel, W. (1979). Prototypes in personal perception. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 12, pp. 3-52). New York: Academic Press.
- Carney, R. E. (1971). Risk taking behavior. Springfield, IL: Thomas Publications.
- Carroll, N., & Gillen, D. J. (1987). Are classical management functions useful in describing managerial work? Academy of Management Review, 12, 38-51.
- Caspi, A. (1987). Personality in the life course. Journal of Personality and Social Psychology, 53, 1203-1213.

- Caspi, A., Bem, D. J., & Elder, G. H. (1989). Continuities and consequences of interactional styles across the life course. Journal of Personality, 57, 375-406.
- Chambers, J. A. (1964). Relating personality and biographical factors to scientific creativity. Psychological Monographs, 78, N22.
- Charlesworth, (1976). Human intelligence as adaptation: An ethological approach. In L. B. Resnick, The nature of intelligence. Hillsdale, NJ: Erlbaum.
- Chi, M.T.H., Bassock, M., Lewis, M. W., Reiman, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. Cognitive Science, 13, 145-182.
- Chi, M. T., Glaser, R., & Rees, E. (1982). Expertise in problem solving. In R. J. Sternberg (Ed.), Advances in the psychology of human intelligence. Hillsdale, NJ: Erlbaum.
- Chowdhry, K., & Newcomb, T. W. (1952). The relative abilities of leaders and nonleaders to estimate opinions of their own groups. Journal of Abnormal and Social Psychology, 47, 51-57.
- Clawson, J. G. (1980). Mentoring in managerial careers. In C. B. Derr (Ed.), Work, family, and career. New York: Praeger.
- Clifford, M. M., Kim, A., & McDonald, B. A. (1988). Responses to failure as influenced by task attribution, outcome attribution, and failure tolerance. Journal of Experimental Education, 57(1), 19-37.
- Collins, E.G.C., & Scott, P. (1978). Everyone who makes it has a mentor. Harvard Business Review, 56(4), 89-101.
- Comte, E. D., Verschaffel, L., & Dewin, L. (1985). Influence of rewording problems on children's problem representations and solutions. Journal of Educational Psychology, 77, 460-476.
- Connelly, M. S. (1991). A causal analysis of adolescent leadership. Fairfax, VA: George Mason University, Center for Behavioral and Cognitive Studies.
- Cornwell, J. M. (1983). Meta-analysis of selected trait research in the leadership literature. Paper presented at the meeting of the Southeastern Psychological Association, Atlanta, GA.
- Costa, P. T., & McCrae, R. R. (1976). Age differences in personality structure: A cluster analytic approach. Journal of Gerontology, 31, 564-570.

- Costa, P. T., & McCrae, R. R. (1978). Age differences in personality structure revisited: Studies in validity, stability, and change. International Journal of Aging and Human Development, 8, 295-309.
- Costa, P. T., & McCrae, R. R. (1980). Still stable after all these years: Personality as a key to some issues in adulthood and old age. In P. B. Baltes & O. G. Brim, Jr. (Eds.), Life span development and behavior. New York: Academic Press.
- Costa, P. T., & McCrae, R. R. (1985). The NEO Personality Inventory manual. Odessa, FL: Psychological Assessment Resources.
- Costa, P. T., & McCrae, R. R. (1988). Personality in adulthood: A six-year longitudinal study of self-reports and sparse ratings on the NEO Personality Inventory. Journal of Personality and Social Psychology, 54, 853-863.
- Covington, M. U. (1987). Instruction in problem solving and planning. In S. C. Friedman, I. K. Scholnick, & R. R. Cocking (Eds.), Blueprints for thinking: The role of planning in cognitive development. New York: Cambridge University Press.
- Crocket, W. H. (1965). Cognitive complexity and impression formation. In B. A. Maher (Ed.), Progress in experimental personality research (Vol. 2). New York: Academic Press.
- Cushmir, K., & Koberg, E. (1986). Creativity differences among managers. Journal of Vocational Behavior, 29, 240-253.
- Davey, B., & McBride, S. (1986). Effects of question generation training on reading comprehension. Journal of Educational Psychology, 78, 256-262.
- Dawis, R. V., & Lofquist, L. H. (1984). A psychological theory of work adjustment. Minneapolis, MN: University of Minnesota Press.
- deCharms, R. (1968). Personal causation. New York: Academic Press.
- Degroot, A. D. (1966). Perception and memory versus thought. In B. Kleinmuntz (Ed.), Problem-solving. New York: Wiley.
- DeVeau, R. J. (1976). The relationships between leader effectiveness of first-line supervisors and measures of authoritarianism, creativity, general intelligence, and leadership style. Dissertation Abstracts International, 37(3-A), 1360-1361.
- Diener, E. (1984). Subjective well being. Psychological Bulletin, 95, 542-575.

- Dillion, J. T. (1982). Problem finding and solving. Journal of Creative Behavior, 16, 97-111.
- Dirnell, D., & Glover, J. A. (1985). Advance organizers: Encoding manipulations. Journal of Educational Psychology, 77, 514-521.
- Dweck, C. S. (1986). Motivational processes affecting learning. American Psychologist, 41, 1040-1048.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. Psychological Review, 95(2), 256-273.
- Edwards, J. R., & Sproull, M. R. (1984). Creativity: Productivity gold mine? Journal of Creative Behavior, 18, 175-184.
- Einhorn, H. J., & Hogarth, R. M. (1981). Behavioral decision theory. In M. R. Rosenzweig & L. W. Porter (Eds.), Annual Review of Psychology. Palo Alto, CA: Annual Reviews, Inc.
- Elder, G. H. (1974). Children of the great depression. Chicago: University of Chicago Press.
- Elder, G. H., & Clipp, E. C. (1989). Combat experience and emotional health: Impairment and resilience in later life. Journal of Personality, 57, 311-342.
- Erickson, E. H. (1950). Childhood and society. New York: Norton & Co.
- Erickson, E. H. (1959). Identity and the life cycle. Psychological Issues, 1, 18-164.
- Feldman, D. C. (1989). Socialization, resocialization, and training: Reframing the research agenda. In I. L. Goldstein (Ed.), Training and development in organizations. San Francisco: Jossey-Bass.
- Feldman, J. M., & Lindell, M. K. (1988). On rationality. Unpublished manuscript.
- Fiedler, F. E. (1957). A note on leadership theory: The effect of social barriers between leaders and followers. Sociometry, 20, 87-94.
- Fiedler, F. E. (1972a). Predicting the effects of leadership training and experience from the contingency model. Journal of Applied Psychology, 56, 114-119.
- Fiedler, F. E. (1972b). The effects of leadership training and experience: A contingency model interpretation. Administrative Science Quarterly, 17, 453-470.



- Fiedler, F. E. (1978). The contingency model and the dynamics of the leadership process. In L. Berkowitz (Ed.), Advances in experimental social psychology. New York: Academic Press.
- Fiedler, F. E., & Garcia, J. E. (1987). New approaches to effective leadership: Cognitive resources and organizational performance. New York: Wiley.
- Fiedler, F. E., & Leister, A. F. (1977). Leader intelligence and task performance: A test of a multiple screen model. Organizational Behavior and Human Performance, 20, 1-14.
- Fiedler, F. E., & Meuwese, W.A.T. (1963). Leader's contribution to task performance on cohesive and uncohesive groups. Journal of Abnormal and Social Psychology, 67, 83-87.
- Fiedler, F. E., Potter, E. H., III, Zais, M. M., & Knowlton, W. A., Jr. (1979). Organizational stress and the use and misuse of managerial intelligence and experience. Journal of Applied Psychology, 64, 635-647.
- Fine, S. A. (1974). Functional job analysis: An approach to a technology for manpower planning. Personnel Journal, 53, 813-818.
- Fine, S. A. (1988). Functional job analysis. In S. Gael (Ed.), The job analysis handbook for business, industry, and government. New York: Wiley.
- Fishbein, H. D., Eckart, T., Lauver, E., Van Leeuwen, R., & Langmeyer, D. (1990). Learner's questions and comprehension in a tutoring setting. Journal of Educational Psychology, 82, 163-170.
- Fiske, S. T., & Taylor, S. E. (1984). Social cognition. Reading, MA: Addison-Wesley.
- Fitzgerald, J., & Teasley, A. B. (1986). Effects of instruction in narrative structure on children's writing. Journal of Educational Psychology, 78(6), 424-432.
- Fleishman, E. A. (1957). Factor structure in relation to task difficulty in psychomotor performance. Educational and Psychological Measurement, 17, 522-532.
- Fleishman, E. A. (1967). Development of a behavior taxonomy for describing human tasks: A correlational-experimental approach. Journal of Applied Psychology, 51, 1-10.
- Fleishman, E. A. (1972). On the relation between abilities, learning, and human performance. American Psychologist, 27, 1017-1032.

- Fleishman, E. A. (1973). Twenty years of consideration and structure. In E. A. Fleishman & J. G. Hunt (Eds.), Current developments in the study of leadership. Carbondale, IL: University of Southern Illinois Press.
- Fleishman, E. A. (1975). Toward a taxonomy of human performance. American Psychologist, 30, 1127-1149.
- Fleishman, E. A. (1982). Systems for describing human tasks. American Psychologist, 37, 1-14.
- Fleishman, E. A., & Friedman, L. (1990). Cognitive competencies related to management performance requirements in R&D organization (CBCS Final Report 90-2). Fairfax, VA: Center for Behavioral and Cognitive Studies, George Mason University.
- Fleishman, E. A., & Harris, E. F. (1962). Patterns of leadership behavior related to employee grievances and turnover. Personnel Psychology, 15, 43-56.
- Fleishman, E. A., & Hempel, W. E. (1954). Changes in factor structure of a complex psychomotor test as a function of practice. Psychometrics, 18, 239-252.
- Fleishman, E. A., & Hempel, W. E. (1955). The relations between abilities and improvement with practice in a visual discrimination reaction task. Journal of Experimental Psychology, 49, 301-312.
- Fleishman, E. A., Harris, E. F., & Burt, H. E. (1955). Leadership and supervision in industry. Columbus, OH: Bureau of Educational Research, Ohio State University.
- Fleishman, E. A., & Mumford, M. D. (1988). Ability requirement scales. In S. Gael (Ed.), The job analysis handbook for business, industry, and government (Vol. 2). New York: Wiley.
- Fleishman, E. A., & Mumford, M. D. (1989a). Individual attributes and training performance: Applications of ability taxonomies in instructional system design. In I. L. Goldstein (Ed.), Frontiers of industrial and organizational psychology: Training and career development. San Francisco: Jossey-Bass.
- Fleishman, E. A., & Mumford, M. D. (1989b). Abilities as causes of individual differences in skill acquisition. Human Performance, 2, 201-222.
- Fleishman, E. A., Mumford, M. D., Zaccaro, S. J., Levin, K. Y., & Hein, M. B. (in press). Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation. Leadership Quarterly.

- Fleishman, E. A., & Quaintance, M. K. (1984). Taxonomies of human performance: The description of human tasks. Orlando, FL: Academic Press.
- Fleishman, E. A., & Zaccaro, S. J. (in press). Toward a taxonomy of team performance functions. In R. W. Swezey and E. Salas (Eds.), Teams: Their training and performance. Norwood, NJ: ALEX.
- Flower, L. S., & Hayes, J. R. (1986). Images, plans, and prose: The representation of meaning in writing. Written Communication, 1, 126-160.
- Ford, M. E. (1986). A living systems conceptualization of social intelligence: Outcomes, processes, and developmental change. In R. J. Sternberg (Ed.), Advances in the psychology of human intelligence. Hillsdale, NJ: Erlbaum.
- Frederickson, N., & Evans, F. R. (1974). Effects of models of creative performance on ability to formulate hypotheses. Journal of Educational Psychology, 66, 67-82.
- Freud, S. (1940). Outline of psychoanalysis. New York: Norton.
- Friedman, S. L., Scholnick, E. K., & Cocking, R. R. (Eds.) (1987). Blueprints for thinking: The role of planning in cognitive developments. Cambridge: Cambridge University Press.
- Frost, D. E., Fiedler, F. E., & Anderson, J. W. (1983). The role of personal risk-taking in effective leadership. Human Relations, 36, 185-202.
- Funder, D. C., & Block, J. (1989). The role of ego-control, ego-resiliency, and IQ in delay of gratification in adolescence. Journal of Personality and Social Psychology, 57(6), 1041-1050.
- Funder, D. C., Block, J. H., & Block, J. (1983). Delay of gratification: Some longitudinal personality correlates. Journal of Personality and Social Psychology, 44, 1198-1213.
- Gardner, H. (1988). Creativity: An interdisciplinary perspective. Creativity Research Journal, 1, 27-51.
- Gentner, D., & Toupin. (1986). Systematicity and surface similarity in the development of analogy. Cognitive Science, 10(3), 277-300.
- Gettinger, M., & White, M. A. (1979). Which is the stronger correlate of school learning, time to learn or measured intelligence? Journal of Educational Psychology, 71, 405-412.

- Gettys, C. F., & Fisher, S. D. (1979). Hypothesis plausibility and hypothesis generation. Organizational Behavior and Human Performance, 24, 93-110.
- Gettys, C. F., Pliske, R. M., Manning, C., & Casey, J. T. (1987). An evaluation of human act generation performance. Organizational Behavior and Human Decision Process, 39, 23-51.
- Getzels, J. W. (1975). Problem finding and the inventiveness of solutions. Journal of Creative Behavior, 9, 12-18.
- Getzels, J. W., & Csikszentmihalyi, M. (1975). From problem solving to problem finding. In I. A. Taylor & J. W. Getzels (Eds.), Perspectives in creativity. Chicago: Aldine.
- Getzels, J. W., & Csikszentmihalyi, M. (1976). The creative vision: A longitudinal study of problem findings in art. New York: Wiley.
- Ghiselin, B. (1963). Ultimate criteria for two levels of creativity. In C. W. Taylor & F. Barrow (Eds.), Scientific creativity: Its recognition and development. New York: Wiley.
- Ghiselli, E. E. (1973). The validity of aptitude tests in personnel selection. Personnel Psychology, 26, 461-472.
- Gibb, C. A. (1969). Leadership. In G. Lindzey & E. Aronson (Eds.), The handbook of social psychology (2nd ed., Vol. 4). Reading, MA: Addison-Wesley.
- Gibson, J. J. (1979). An ecological approach to visual perception. Boston: Houghton-Mifflin.
- Gick, M. L., & Holyoak, K. J. (1980). Analogical problem solving. Cognitive Psychology, 12, 306-355.
- Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. Cognitive Psychology, 15, 1-38.
- Gillen, D. J., & Carroll, J. P. (1985). Relationship of managerial ability to unit effectiveness in more organized versus more mechanistic departments. Journal of Management Studies, 22, 668-670.
- Goldstein, I. L. (1989). Critical training issues: Past, present, and future. In I. L. Goldstein (Ed.), Training and development in organizations. San Francisco: Jossey-Bass.

- Goldstein, I. L. (1986). Training and development in organizations: Needs assessment, development, and evaluation. Monterey, CA: Brooks/Cole.
- Gough, H. G. (1957). Manual for the California Psychological Inventory. Palo Alto, CA: Consulting Psychologists Press.
- Gough, H. G. (1975). Manual for the California Psychological Inventory. Palo Alto, CA: Consulting Psychologists Press.
- Gough, H. G. (1976). Studying creativity by means of word association tests. Journal of Applied Psychology, 61, 348-353.
- Gough, H. G. (1979). A creative personality scale for the Adjective Check List. Journal of Personality and Social Psychology, 37, 1398-1405.
- Gough, H. G. (1987). Administrator's guide for the California Psychological Inventory. Palo Alto, CA: Consulting Psychologists Press.
- Graen, G. (1976). Role making processes within complex organizations. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand-McNally.
- Graen, G., & Schiemann, W. (1978). Leader-member agreement: A vertical dyad linkage approach. Journal of Applied Psychology, 63, 206-212.
- Greeno, J. G., & Leinhardt, G. (1986). The cognitive skill of teaching. Journal of Educational Psychology, 78, 75-95.
- Guilford, J. P. (1950). Creativity. American Psychologist, 14, 469-479.
- Guilford, J. P. (1967). The nature of human intelligence. New York: McGraw-Hill.
- Guilford, J. P., & Guilford, J. S. (1980). Consequences: Manual of instructions and interpretations. Orange, CA: Sheridan Psychological Services.
- Guilford, J. P., & Hoepfner, R. (1971). The analysis of intelligence. New York: McGraw-Hill.
- Gustafson, J. E. (1984). A unifying model for the structure of intellectual abilities. Intelligence, 8, 179-203.
- Gustafson, S. B., & Magnusson, D. (1991). Female life careers: A pattern approach. Hillsdale, NJ: Erlbaum.

- Hackman, J. R., & Oldham, G. R. (1980). Work redesign. Reading, MA: Addison-Wesley.
- Hackman, J. R., & Walton, R. E. (1986). Leading groups in organizations. In P. S. Goodman & Associates (Eds.), Designing effective work groups. San Francisco: Jossey-Bass.
- Halff, H. M., Holan, J. D., & Hutchins, E. L. (1986). Cognitive science and military training. American Psychologist, 41, 1131-1140.
- Hall, D. T. (1986). Introduction: An overview of current career development theory research and practice. In D. T. Hall & Associates (Eds.), Career development in organizations. San Francisco: Jossey-Bass.
- Handel, A. (1987). Personal theories about the life-span development of one's self in autobiographical self-presentations of adults. Human Development, 30, 83-98.
- Hasselhorn, M., & Konkel, J. (1986). Metacognitive versus traditional reading instructions. Human Learning, 5, 75-86.
- Hater, J. J., & Bass, B. M. (1988). Supervisors' evaluations and subordinates' perceptions of transformational and transactional leadership. Journal of Applied Psychology, 73, 695-702.
- Hausman, C. R. (1988). Novelty and explanation in F&L proposal for an evolutionary theory of discovery and innovation. Journal of Social and Biological Structures, 11, 96-98.
- Havinghurst, R. (1953). Human development and education. New York: Longmans.
- Hayes, J. R., & Flower, L. S. (1986). Writing research and the writer. American Psychologist, 41, 1106-1113.
- Hayes-Roth, B., & Hayes-Roth, K. (1979). A cognitive model of planning. Cognitive Science, 3, 275-310.
- Headey, B., & Wearing, A. (1989). Personality, life events, and subjective well-being: Toward a dynamic equilibrium model. Journal of Personality and Social Psychology, 57(4), 731-739.
- Hennessey, B. A., & Amabile, T. M. (1988). The conditions of creativity. In R. J. Sternberg (Ed.), The nature of creativity (pp. 11-42). New York: Cambridge University Press.

- Higgins, T. E. (1987). Self discrepancy: A theory relating self and affect. Psychological Review, 94, 319-340.
- Hinrichs, J. R., Haanpera, S., & Sonkin, L. (1976). Validity of a biographical information blank across national borders. Personnel Psychology, 29, 417-421.
- Hinton, B. L. (1968). Environmental frustration and creative problem solving. Journal of Applied Psychology, 52, 211-217.
- Hocevar, D. (1981). Measurement of creativity: Review and critique. Journal of Personality Assessment, 45, 450-464.
- Hogarth, R. M. (1986). Decision making. New York: Wiley.
- Holland, J. L. (1973). Making vocational choices: A theory of careers. Englewood Cliffs, NJ: Prentice-Hall.
- Holland, J. L. (1976). Vocational preferences. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand & McNally.
- Hollander, E. P. (1964). Leaders, groups, and influence. New York: Oxford University Press.
- Hoover, S. M., & Feldhusen, J. F. (1990). The scientific hypothesis formulation ability of gifted ninth-grade students. Journal of Educational Psychology, 82, 838-848.
- Horner, T. A. (1983). Killers, fillers, and fodder. Journal of the American War College, 32, 27-33.
- Hotard, S. R., McFatter, R. M., McWirtter, R. M., & Stegall, M. E. (1989). Interactive effects of extraversion, neuroticism and social relationships on subjective well-being. Journal of Personality and Social Psychology, 57, 321-331.
- Hough, L. M. (1984). Development and evaluation of the "Accomplishment Record" method of selecting and promoting professionals. Journal of Applied Psychology, 69(1), 135-146.
- House, R. J., & Baetz, M. L. (1979). Leadership: Some empirical generalizations and new research directions. Research in Organizations Behavior, 1, 341-423.
- House, R. J., & Mitchell, T. R. (1968). Path goal theory of leadership. Journal of Contemporary Business, 3, 81-97.

- Howard, A., & Bray, D. W. (1988). Managerial lives in transition: Advancing age and changing times. New York: Guilford.
- Howe, A. (1982). Biographical evidence and the development of outstanding individuals. American Psychologist, 37, 1071-1081.
- Howell, J. M. (1988). Two faces of charisma: Socialized and personalized leadership in organizations. In J. Conger & R. Kanungo (Eds.), Charismatic leadership: The illusive factor in organizational effectiveness. San Francisco: Jossey-Bass.
- Howell, J. P., & Dorfman, P. W. (1981). Substitutes for Leadership: Test of a construct. Academy of Management Journal, 24(4), 714-728.
- Howell, J. P., Dorfman, P. W., & Kerr, S. (1986). Moderator variables in leadership research. Academy of Management Review, 11(1), 88-102.
- Hulin, C. L., Henry, R. A., & Noon, S. L. (1989). Adding a dimension: Time as a factor in the generalizability of predictive relationships. Psychological Bulletin, 107(3), 328-340.
- Humphreys, L. G. (1979). The construct of general intelligence. Intelligence, 3, 105-120.
- Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alterative predictors of job performance. Psychological Bulletin, 96, 72-98.
- Jackson, D. N. (1976). Jackson Personality Inventory: Inventory manual. Port Huron, MI: Research Psychologists Press.
- Jackson, D. N. (1984). Personality Research Form manual (3rd ed.). Port Huron, MI: Research Psychologists Press.
- Jackson, P. N., & Helmes, E. (1979). Personality structure and the circumplex. Journal of Personality and Social Psychology, 37, 2278-2285.
- Jacobs, T. O., & Jaques, E. (1989). Military executive leadership. In K. E. Clark & M. B. Clark (Eds.), Measures of leadership (pp. 281-296). Greensboro: Center for Creative Leadership.
- Jacobs, T. O., & Jaques, E. (1987). Leadership in complex systems. In J. A. Zeidner (Ed.), Human productivity enhancement, Vol. II: Organizations and personnel (pp. 201-245). New York: Praeger.



- James, L. R., Demaree, R., Muliak, S. A., & Mumford, M. D. (1988). Validity generalization: A rejoinder to Schmidt, Hunter, and Raju. Journal of Applied Psychology, 73, 443-452.
- James, L. R., & James, L. A. (1984). Integrating work environment perceptions: Explorations into the measurement of meaning. Journal of Applied Psychology, 74, 739-751.
- Jaques, E. (1977). A general theory of bureaucracy. London, England: Heineman.
- Jenkins, W. O. (1947). A review of leadership studies with particular reference to military problems. Psychological Bulletin, 4, 54-79.
- Kagan, J., Sontag, L. W., Baker, C. T., & Nelson, U. L. (1958). Personality and IQ change. Journal of Abnormal and Social Psychology, 56, 261-266.
- Kahn, R. C., & Artonucci, T. C. (1980). Convoys over the life course: Attachment, roles, and social support. In P. B. Baltes & O. G. Brim, Jr. (Eds.), Life span development and behavior. New York: Academic Press.
- Kahneman, D. (1972). Subjective probabilities: A judgment of representativeness. Cognitive Psychology, 3, 430-454.
- Kanter, R. M. (1977). Men and women of the corporation. New York: Basic Books.
- Karmel, B. (1978). Leadership: A challenge to traditional research methods and assumptions. Academy of Management Review, 3, 475-482.
- Katz, D., & Kahn, R. L. (1978). The social psychology of organizations, revised edition. New York: Wiley.
- Keller, N. R. (1983). The emergence of expertise in small groups. Dissertation Abstracts International, 45(2B), 724.
- Kenny, D. A., & Zaccaro, S. J. (1983). An estimate of variance due to traits in leadership. Journal of Applied Psychology, 68, 678-685.
- Kenrick, D. T., & Funder, D. C. (1988). Profiting from controversy: Lessons from the person situation debate. American Psychologist, 43, 23-34.
- Kerr, S., & Jermier, J. (1978). Substitutes for leadership: Their meaning and measurement. Organizational Behavior and Human Performance, 22(4), 375-403.

- Klein, S. P., & Owens, W. A. (1965). Faking of a scored life history as a function of criterion objectivity. Journal of Applied Psychology, 49, 451-454.
- Koestler, A. (1964). The act of creation. New York: Macmillan.
- Kohlberg, L. (1968). Early education: A cognitive developmental view. Child Development, 34, 1013-1062.
- Kram, K. E. (1986). Mentoring in the workplace. In D. T. Hall & Associates (Eds.), Career development in organizations. San Francisco: Jossey-Bass.
- Krietler, S., & Krietler, H. (1987). Plans and planning: Their motivational and cognitive antecedents. In S. L. Friedman, E. D. Scholnick, & R. R. Cocking (Eds.), Blueprints for thinking: The role of planning on cognitive development. New York: Cambridge University Press.
- Kuhn, T. S. (1970). The structure of scientific revolutions. Chicago: University of Chicago Press.
- Kyllonen, P. C., Lohman, D. F., & Snow, R. E. (1984). Effects of aptitudes, strategy training, and task facets on spatial task performance. Journal of Educational Psychology, 76(1), 130-145.
- Langley, P., & Jones, R. (1988). A computational model of scientific insight. In R. J. Sternberg (Ed.), The nature of creativity, (pp. 177-182). New York: Cambridge University Press.
- Laurent, H. (1962). Early identification of management talent. Management Record, 24, 33-38.
- Laurent, H. (1970). Cross-cultural cross-validation of empirically validated tests. Journal of Applied Psychology, 54, 417-423.
- Leinhardt, G., & Smith, D. A. (1983). Expertise in mathematics instruction: Subject matter knowledge. Journal of Educational Psychology, 77, 247-271.
- Lerner, R. M. (1978). Nature, nurture, and dynamic interactionism. Human Development, 21, 1-20.
- Lerner, R. M., & Tubman, J. G. (1989). Conceptual issues in studying continuity and discontinuity in personality development across life. Journal of Personality, 57, 343-373.
- Likert, R. (1961). New patterns of management. New York: McGraw-Hill.

- Livson, N., & Peskin, H. (1972). The prediction of adult psychological health in a longitudinal study. Journal of Abnormal Psychology, 72, 509-518.
- Lorch, R. F., & Lorch, E. P. (1985). Topic structure representation and text recall. Journal of Educational Psychology, 77, 137-148.
- Lord, F. M. (1977). Functional leadership behavior: Measurement and relation to social power and leadership perceptions. Administrative Science Quarterly, 22, 114-133.
- Lord, R. G., Devader, C. L., & Alliger, G. M. (1986). A meta-analysis of the relationship between personality traits and leadership perceptions: An application of validity generalization procedures. Journal of Applied Psychology, 71, 402-410.
- Lord, R. G., & Foti, R. J. (1986). Schema theories, information processing, and organizational behavior. In H. P. Sims & D. A. Gioia (Eds.), The thinking organization. San Francisco: Jossey-Bass.
- MacKinnon, D. W. (1962). The nature and nurture of creative talent. American Psychologist, 17, 484-495.
- Magnusson, D. (1988). Individual development from an interaction perspective. In D. Magnusson (Ed.), Paths through life (pp. 1-18). Hillsdale, NJ: Erlbaum.
- Mann, R. D. (1959). A review of the relationship between personality and performance in small groups. Psychological Bulletin, 56, 241-270.
- Manz, C. C., & Sims, H. P. (1989). Beyond imitation: Complex behavioral and affective linkages resulting from exposure to leadership training. Journal of Applied Psychology, 71, 571-578.
- Manz, C. C., & Sims, H. P. (1990). Super leadership.
- Marlowe, H. A., Jr. (1986). Social intelligence: Evidence for multidimensionality and construct independence. Journal of Educational Psychology, 78(1), 52-58.
- McArthur, L. Z., & Baron, R. M. (1983). Toward an ecological theory of social perception. Psychological Review, 90(3), 215-238.
- McClelland, D. C. (1975). Power: The inner experience. New York: Irvington Publishers (distributed by Halstead Press).
- McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953). A scoring manual for the achievement motive. In J. W. Atkinson (Ed.), Motives in fantasy, action, and society. Princeton, NJ: Van Nostrand, 1958.

- McClelland, D. C., & Boyatzis, R. E. (1982). Leadership motive pattern and long-term success in management. Journal of Applied Psychology, 67, 737-743.
- McCormick, E. J. (1979). Job analysis: Methods and applications. New York: Amacom.
- McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. Journal of Personality and Social Psychology, 54, 1258-1265.
- McCrae, R. R., & Costa, P. T. (1983). Joint factors in self-reports and ratings: Neuroticism, extraversion, and openness to experience. Personality and Individual Differences, 4, 245-255.
- McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. Journal of Personality and Social Psychology, 52, 81-90.
- McCrae, R. R., & Costa, P. T. (1990). Personality in adulthood. New York: Guilford.
- McCrae, R. R., & Costa, P. T. (1991). Adding Liebe und Arbeit: The full five-factor model and well-being. Personality and Social Psychology Bulletin, 17(2), 227-232.
- McGee, M. (1979). Human spatial abilities: Psychometric studies and environmental, genetic, hormonal, and neurological influences. Psychological Bulletin, 86, 889-917.
- McGrath, J. E. (1964). Leadership behavior: Some requirements for leadership training. Washington, DC: Office of Career Development, U.S. Civil Service Commission.
- McGuire, W. J. (1983). A contextualist theory of knowledge: Its implications for innovation and reform in psychological research. Advances in Experimental Social Psychology.
- Medin, D. L., & Ross, B. H. (in press). The specific character of abstract thought: Categorization, problem solving, and induction. In R. J. Sternberg (Ed.), Advances in the psychology of human intelligence. Hillsdale, NJ: Erlbaum.
- Meehle, T. (1982). Hypothesis generation in an automobile malfunctioning inference task. Acta Psychologica, 52, 87-106.
- Mintzberg, H. (1990). The manager's job: Folklore and fact. Harvard Business Review, 68, 163-176.
- Misumi, J. (1985). The behavioral science of leadership. Ann Arbor, MI: University of Michigan Press.

- Morrison, R. F., & Sebold, M. (1974). Personal characteristics differentiating female executives from female nonexecutive personnel. Journal of Applied Psychology, 59, 656-659.
- Morrison, R. F., Owens, W. A., Glennon, J. R., & Albright, L. E. (1962). Factored life history antecedents of industrial research performance. Journal of Applied Psychology, 46, 656-659.
- Moss, F. A. (1931). Preliminary report of a study of social intelligence and executive ability. Public Personnel Studies, 9, 2-9.
- Moss, F. A., & Hunt, T. (1927). Are you socially intelligent? Scientific American, 137, 108-110.
- Motamedi, K. (1982). Extending the concept of creativity. Journal of Creative Behavior, 16, 112-122.
- Mumford, M. D. (1983). Social comparison theory and the validity of peer evaluations. Personnel Psychology, 36, 867-882.
- Mumford, M. D. (1986). Leadership in the organizational context: Some empirical and theoretical considerations. Journal of Applied Psychology, 16, 508-531.
- Mumford, M. D., & Connelly, M. S. (in press). Leaders as creators: Leader performance and problem solving in ill-defined domains. Leadership Quarterly.
- Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. Psychological Bulletin, 103, 27-43.
- Mumford, M. D., Mobley, M. I., Uhlman, C. E., Reiter-Palmon, R., & Doares, L. (1991). Process analytic models of creative thought. Creativity Research Journal, 4, 91-122.
- Mumford, M. D., O'Connor, J., Clifton, T. C., Connelly, M. S., & Zaccaro, S. J. (1991). Background data constructs as predictors of leadership behavior. Fairfax, VA: Center for Behavioral and Cognitive Studies, George Mason University.
- Mumford, M. D., & Owens, W. A. (1982). Life history and vocational interests. Journal of Vocational Behavior, 21, 330-348.
- Mumford, M. D., & Owens, W. A. (1984). Individuality in a developmental context: Some empirical and theoretical considerations. Human Development, 27, 84-108.

- Mumford, M. D., & Owens, W. A. (1987). Methodology review: Principles, procedures, and findings in the application of background data measures. Applied Psychological Measurement, 11, 1-31.
- Mumford, M. D., Reiter-Palmon, R., & Redmond, M. R. (in press). Problem construction and cognition: Applying problem representations in ill-defined domains. In M. Runco (Ed.), Problem finding, problem solving, and creativity.
- Mumford, M. D., Snell, A. F., & Hein, M. B. (in press). Varieties of religious experience: Person influence on continuity and change. Journal of Personality.
- Mumford, M. D., Snell, A. F., & Reiter-Palmon, R. (in press). Personality and background data: Life history and self-concepts in an ecological system. In G. S. Stokes, M. D. Mumford, & W. A. Owens (Eds.), Handbook of background data research: Theories, measures, and applications. Palo Alto, CA: Consulting Psychologists Press.
- Mumford, M. D., & Stokes, G. S. (in press). Developmental determinants of individual action: Theory and practice in the application of background data measure. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology, II. Palo Alto, CA: Consulting Psychologists Press.
- Mumford, M. D., Stokes, G. S., & Owens, W. A. (1990). Patters of life adaptation: The ecology of human individuality. Hillsdale, NJ: Erlbaum.
- Mumford, M. D., Uhlman, C. E., & Kilcullen, R. N. (in press). The structure of life history: Implications for the construct validity of background data scales. Human Performance.
- Mumford, M. D., Weeks, J. L., Harding, F. H., & Fleishman, E. A. (1988). Individual and situational determinants of technical training performance: An exploratory modeling effort. Journal of Applied Psychology, 73, 443-452.
- Mumford, M. D., Weeks, J. L., Harding, F. H., & Fleishman, E. A. (1987). Measuring occupational difficulty: A construct validation against training criteria. Journal of Applied Psychology, 72, 578-587.
- Mumford, M. D., Wesley, S. S., & Shaffer, G. S. (1987). Individuality in a developmental context. The crystallization of developmental trajectories. Human Development.
- Mumford, M. D., Yarkin-Levin, K., Korotkin, A. L., Wallis, M. R., & Marshall-Mies, J. (1985). Characteristics relevant to performance as an army leader: Knowledge, skills, abilities, other characteristics, and general skills. Bethesda, MD: Advances Research Resources Organization.

- Murphy, K. R. (1989). Is the relationship between cognitive ability and job performance stable over time? Human Performance, 3, 183-200.
- Myers, I. B. (1987). Introduction to type: A description of the theory and applications of the Myers-Briggs Type Indicator (4th ed.). Palo Alto, CA: Consulting Psychologists Press.
- Myers, I. B., & McCaulley, M. H. (1985). Manual: A guide to the development and use of the Myers-Briggs type indicator. Palo Alto, CA: Consulting Psychologists Press.
- Nicholls, J. G. (1976). Creativity in the person who will never produce anything original and useful: The concept of creativity as a normally distributed trait. American Psychologist, 27, 717-727.
- O'Donnel, A. M., Hall, R. H., Hythecker, V. I., Dansereau, D. F., Skaggs, L. P., Peel, J. L., & Rewey, K. L. (1990). Learning concrete procedures: Effects of processing strategies and cooperative learning. Journal of Educational Psychology, 82, 171-177.
- Overton, W. F., & Reese, H. W. (1973). Models of development: Methodological implications. In J. R. Nesselroade & H. W. Reese (Eds.), Life span developmental psychology: Methodological issues. New York: Academic Press.
- Owen, E., & Sweller, D. (1985). What do students learn while solving mathematics problems. Journal of Educational Psychology, 77, 272-284.
- Owens, W. A. (1953). Age and mental abilities: A longitudinal study. Genetic Psychological Monographs, 48, 3-54.
- Owens, W. A. (1969). Cognitive, noncognitive, and environmental correlates of mechanical ingenuity. Journal of Applied Psychology, 53, 199-208.
- Owens, W. A. (1976). Background data. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology (pp. 609-644). Chicago: Rand-McNally.
- Owens, W. A., & Schoenfeldt, L. F. (1979). Toward a classification of persons. Journal of Applied Psychology, 64, 569-607.
- Parker, J. R., & Fleishman, E. A. (1961). Use of analytical information concerning task requirements to increase the effectiveness of skill training. Journal of Applied Psychology, 45, 295-302.
- Paulus, D. L., & Martin, C. L. (1988). Functional flexibility: A new conception. Journal of Personality and Social Psychology, 55, 88-101.

- Pelz, D. C. (1952). Influence: A key to effective leadership in first-line managers. Personnel, 29, 205-217.
- Pelz, D. C. (1953). The influence: A key to effective leadership in the first-line supervisor. Personnel, 29, 209-217.
- Pelz, D. C. (1956). Some social factors related to performance in a research organization. Administrative Science Quarterly, 1, 310-325.
- Perkins, D. N. (1985). Postprimary education has little impact on informal reasoning. Journal of Educational Psychology, 77, 562-571.
- Peters, L. H., & O'Connor, E. J. (1980). Situational constraints and work outcomes: The influences of a frequently overlooked construct. Academy of Management Review, 5(3), 391-397.
- Peters, L. H., O'Connor, E. J., Eulberg, J. R., & Watson, T. W. (1988). An examination of situational constraints in Air Force work settings. Human Performance, 1(2), 133-144.
- Peters, L. H., O'Connor, E. J., & Rudolf, C. J. (1980). The behavioral and affective consequences of performance-relevant situational variables. Organizational Behavior and Human Performance, 25, 79-96.
- Peterson, C., & Seligman, M. (1984). Causal explanations as a risk factor for depression: Theory and evidence. Psychological Review, 91, 347-374.
- Peterson, N. G., & Bownas, D. A. (1982). Skill, task structure, and performance acquisition. In M. D. Dunnette & E. A. Fleishman (Eds.), Human performance and productivity: Human capability assessment (pp. 49-105). Hillsdale, NJ: Erlbaum.
- Pfeffer, J. (1977). Power and resource allocation in organizations. In B. Staw & G. Salancik (Eds.), New directions in organizational behavior. Chicago: St. Clair Press.
- Pfeffer, J. (1981). Power in organizations. Boston: Pitman.
- Phye, G. D. (1990). Inductive problem solving: Schema inducement and memory based transfer. Journal of Educational Psychology, 82, 826-831.
- Piaget, J. (1967). The psychology of intelligence. London, England: Routledge & Paul.
- Pinchot, J., III. (1985). Intrapreneuring. New York: Harper & Row.



- Pines, G. M. (1987). Mirroring and child development: Psychodynamic and psychological interpretations. In T. Honess & K. Yardley (Eds.), Self and identity: Perspectives across the life span. New York: Rutledge & Kegan Paul.
- Potter, E. H., III, & Fiedler, F. E. (1981). Stress and the utilization of staff member intelligence and experience. Academy of Management Journal, 24, 361-376.
- Pulkkinen. (1982). Self-control and continuity from childhood to adolescence. In P. B. Baltes & O. G. Brim, Jr. (Eds.), Life span development and behavior (Vol. 4). New York: Academic Press.
- Rahman, T., & Bisary, G. L. (1986). Reading ability and use of a strong schema in recalling and reconstructing information. Journal of Educational Psychology, 78, 323-333.
- Redmond, M. R., Mumford, M. D., & Teach, R. (in press). Putting creativity to work: Leader influences on subordinate creativity. Organizational Behavior and Human Decision Processes.
- Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), Life span developmental psychology: Research and theory. New York: Academic Press.
- Reif, F. (1987). Interpretation of scientific or mathematical concepts: Cognitive issues and instructional implications. Cognitive Science, 11, 395-416.
- Reilly, R. R., & Chao, G. T. (1982). Validity and fairness of some alternative employee selection procedures. Personnel Psychology, 35, 1-62.
- Reitman, W. R. (1964). Heuristic decision procedures, open constraints, and the structure of ill-defined problems. In M. Shelley & G. Bryan (Eds.), Human judgments and optimaticity (pp. 21-98). New York: Wiley.
- Resnick, L. B. (1984). Cognitive science as educational research: Why we need it now. Washington, DC: National Academy of Education.
- Resnick, L. B., & Glaser, R. (1976). Problem solving and intelligence. In L. B. Resnick, The nature of intelligence. Hillsdale, NJ: Erlbaum.
- Richardson, Bellow, & Henry & Co. (1984). Executive summary: The manager profile record. Washington, DC: Author.
- Riegel, K. F. (1975). Toward a dialectical theory of development. Human Development, 18, 50-64.

- Rist, R. S. (1989). Schema creation in programming. Cognition Science, 13(3), 389-414.
- Roe, A. (1953). The making of a scientist. New York: Dodd Mead.
- Rokeach, M. (1973). The nature of human values. New York: Free Press.
- Rose, L. H., & Lin, H. T. (1984). A meta-analysis of long-term creativity training programs. Journal of Creative Behavior, 18, 11-22.
- Rothenberg, A. (1986). Artistic creation as stimulated by superimposed versus combined-composite visual images. Journal of Personality and Social Psychology, 50, 370-381.
- Rothenberg, A. (1988). Additive and nonadditive factors in creative thought. Journal of Social and Biological Structures, 11, 135-139.
- Rothstein, H. R., Schmidt, F. L., Erwin, F. W., Owens, W. A., & Sparks, C. P. (1990). Biographical data in employment selection: Can validities be made more generalizable? Journal of Applied Psychology, 74, 175-184.
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, No. 609.
- Rotter, J. B. (1982). The development and applications of social learning theory: Selected papers. New York: Praeger.
- Rusmore, J. T. (1984). Executive performance and intellectual ability in organizational levels. San Jose, CA: Advanced Human Systems Institution, San Jose State University.
- Russell, C. J. (1990). Selecting top corporate leaders: An example of biographical information. Journal of Management, 16(1), 73-86.
- Russell, C. J., & Domm, D. R. (1990). On the construct validity of biographical information: Evaluation of a theory based method of item generation. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, Dallas.
- Russell, C. J., Mattson, J., Devlin, S. E., & Atwater, D. (1990). Predictive validity of biodata items generated from retrospective life experience essays.
- Salmoni, A. W., Schmidt, R. A., & Walter, C. B. (1985). Knowledge of results and motor learning: A review and critical reappraisal. Psychological Bulletin, 95, 355-386.

- Scarr, S., & Carter-Saltzman, L. (1982). Genetics and intelligence. In R. J. Sternberg (Ed.), Handbook of human intelligence. New York: Cambridge University Press.
- Schaie, K. W. (1984). Historical time and cohort effects. In K. A. McClusky & H. W. Reese (Eds.), Life span developmental psychology: Historical age generational effects. New York: Academic Press.
- Schaie, K. W., & Geiwitz, J. (1982). Adult development and aging. Boston: Little Brown & Co.
- Schaie, K. W., & Hertzog, C. (1986). Toward a comprehensive model of adult intellectual development. In R. J. Sternberg (Ed.), Advances in the psychology of human intelligence (Vol. 3, pp. 206-241). Hillsdale, NJ: Erlbaum.
- Schein, E. H. (1971). The individual, the organization, and the career: A conceptual scheme. Journal of Applied Behavioral Science, 7, 401-426.
- Schmeck, R. R., & Grove, E. (1979). Academic achievement and individual differences in learning processes. Applied Psychological Measurement, 3, 43-49.
- Schneider, B. (1978). Person-situation selection: A review of some ability-situation interaction research. Personnel Psychology, 31, 281-297.
- Schneider, B. (1987). The people make the place. Personnel Psychology, 40, 437-455.
- Schoenfeldt, L. F. (1974). Utilization of manpower: Development and evaluation of an assessment-classification model for matching individuals with jobs. Journal of Applied Psychology, 59, 583-595.
- Schooler, C. (1984). Psychological effects of complex environments during the life span: A review and theory. Intelligence, 8, 254-281.
- Schriesheim, J. F. (1980). The social context of leader-subordinate relations: An investigation of the effects of group cohesiveness. Journal of Applied Psychology, 65, 183-194.
- Sears, R. R. (1977). Sources of life satisfaction of the Terman gifted men. American Psychologist, 32, 119-128.
- Shaffer, D. R. (1983). Social and personality development. Monterey, CA: Brooks/Cole.
- Shaffer, G. S., Saunders, V., & Owens, W. A. (1986). Additional evidence for the accuracy of biographical information: Long-term retest and observer ratings. Personnel Psychology, 39, 791-809.

- Shorris, E. (1984). Scenes from corporate life: The politics of middle management. New York: Penguin.
- Siegler, R. S., & Richards, J. D. (1982). The development of intelligence. In R. J. Sternberg (Ed.), Handbook of human intelligence. New York: Cambridge University Press.
- Similansky, J. (1984). Problem solving and the quality of invention: An empirical investigation. Journal of Educational Psychology, 76, 377-386.
- Simonton, D. K. (1984). Genius, creativity, and leadership: Historic inquiries. Cambridge, MA: Harvard University Press.
- Simonton, D. K. (1988). Creativity, leadership, and chance. In R. J. Sternberg (Ed.), The nature of creativity: Contemporary theoretical perspectives. Cambridge, MA: Cambridge University Press.
- Sineta, M. (1985). SMR forum: Entrepreneurs, chaos, and creativity--Can creative people really survive like company structure? Sloan Management Review, 33, 57-62.
- Skinner, B. F. (1957). Verbal behavior. New York: Appleton-Century-Crofts.
- Sleeman, D., Kelly, A. E., Martinak, R., Ward, R. D., & Moore, J. L. (1989). Studies of diagnosis and remediation with high school algebra students. Cognitive Science, 13, 551-568.
- Smith, E. (1984). A model of social inference processes. Psychological Review, 91(3), 392-413.
- Snow, R. E., & Lohman, D. R. (1984). Toward a theory of cognitive aptitude for learning from instruction. Journal of Educational Psychology, 76, 347-375.
- Snow, R. E., & Yallow, E. (1982). Education and intelligence. In R. J. Sternberg (Ed.), Handbook of human intelligence. New York: Cambridge University Press.
- Stamp, G. P. (1988). Longitudinal research into methods of assessing managerial potential (ARI Technical Report 819). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A204 878)
- Sternberg, R. J. (1986). Synopsis of a triarchic theory of human intelligence. In S. H. Irvine & S. E. Newstead (Eds.), Intelligence and cognition. Boston: Nithoff.
- Sternberg, R. J. (1988). A three facet model of creativity. In R. J. Sternberg (Ed.), The nature of creativity. Hillsdale, NJ: Erlbaum.

- Sternberg, R. J. (1989). A developmental model of creativity. Paper presented at the meetings of the American Psychological Association, Atlanta, GA.
- Sternberg, R. J., Conway, B. E., Ketron, J. L., & Bernstein, M. (1981). People's conceptions of intelligence. Journal of Personality and Social Psychology, 48, 436-458.
- Stogdill, R. M. (1948). Personal factors associated with leadership: A survey of the literature. Journal of Psychology, 25, 35-71.
- Stokes, G. S., Mumford, M. D., & Owens, W. A. (1989). Life history prototypes and the study of human individuality. Journal of Personality, 57, 509-545.
- Stricker, L. J. (1989). Assessing leadership potential at the Naval Academy with a biographical measure (Tech. Rep. RR-29-14). Princeton, NJ: Educational Testing Service.
- Super, D. E. (1962). The structure of work values in relation to status, achievement, interests, and adjustment. Journal of Applied Psychology, 46, 231-239.
- Swanson, H. L. (1990). Influence of metacognitive knowledge and aptitude on problem solving. Journal of Educational Psychology, 82(2), 306-314.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12(2), 257-285.
- Sweller, J. (1989). Cognitive technology: Some procedures for facilitating learning and problem solving in mathematics and science. Journal of Educational Psychology, 81(4), 457-466.
- Taft, R. (1955). The ability to judge people. Psychological Bulletin, 52, 1-23.
- Taylor, C. W. (1972). Can organizations be creative too? In C. W. Taylor (Ed.), Climate for creativity (pp. 1-15). New York: Pergammon.
- Terman, L. M., & Oden, M. (1947). Genetic studies of genius IV: The gifted child grows up. Stanford, CA: Stanford University Press.
- Terman, L. M., & Oden, M. (1959). The gifted group at mid-life. Stanford, CA: Stanford University Press.
- Thomas, A., & Chess, S. (1981). The role of temperament in contributions of individuals to their development. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), Individuals

- as producers of their own development: A life span perspective. New York: Academic Press.
- Thomas, A., & Chess, S. (1977). Temperament in development. New York: Brunner/Mazel.
- Thorndike, E. L. (1920). Intelligence and its use. Harper's Magazine, 140, 227-235.
- Thorndike, R. L., & Stein, S. (1937). An evaluation of the attempts to measure social intelligence. Psychological Bulletin, 23, 275-285.
- Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its environment. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), Individuals as producers of their own development: A life-span perspective. New York: Academic Press.
- Tornow, W. W., & Pinto, P. R. (1976). The development of a managerial job taxonomy: A system for describing, classifying, and evaluating executive positions. Journal of Applied Psychology, 61, 410-418.
- Tushman, N., & Anderson, P. (1986). Technological discontinuities and organizational environments. Administrative Science Quarterly, 31, 439-465.
- Tyler, L. E. (1965). The psychology of human differences. Englewood Cliffs, NJ: Prentice-Hall.
- Tyler, L. E. (1978). Individuality. San Francisco: Jossey-Bass.
- Underwood, G., Briggs, P., & Underwood, J. D. (1984). Cognitive processes in children's reading attainment. Human Learning, 3, 119-128.
- Vaillant, L. L., & McArthur, C. C. (1972). Natural history and male psychological health in the adult life cycles. Seminars in Psychiatry, 4, 415-427.
- Vernon, P. E. (1933). Some characteristics of the good judge of personality. Journal of Social Psychology, 4, 42-57.
- Von Batalnaffy, L. (1968). General systems theory: Foundations, development, applications. New York: Braziler.
- Vondracek, F. W., Lerner, R. M., Schulenberg, J. E. (1986). Career development: A life-span developmental approach. Hillsdale, NJ: Erlbaum.

- Vroom, V. H. (1976). Leadership. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand-McNally.
- Wagner, R. K., & Sternberg, R. J. (1984). Alternative conceptions of intelligence and their implications for education. Review of Educational Research, 54, 179-223.
- Wagner, R. K., & Sternberg, R. J. (1985). Practical intelligence in real-world pursuits: The role of tacit knowledge. Journal of Personality and Social Psychology, 49, 436-458.
- Walker, R. E., & Foley, J. M. (1973). Social intelligence: Its history and measurement. Psychological Reports, 33, 839-864.
- Wallis, M. R., Mumford, M. D., & Korotkin, A. L. (1985). Development of a single list of leadership/management non-MOS or branch specific tasks for officers and noncommissioned officers. Bethesda, MD: Advanced Research Resources Organization.
- Ward, S. L., Brynes, J. P., & Overton, W. F. (1990). Organization of knowledge and conditional reasoning. Journal of Educational Psychology, 82, 832-837.
- Weed, K., Ryan, E. B., & Day, J. (1990). Metamemory and attributions as mediators of strategy use and recall. Journal of Educational Psychology, 82, 849-855.
- Weisberg, R. W. (1988). Problem solving and creativity. In R. J. Sternberg (Ed.), The nature of creativity: Contemporary psychological perspectives. Cambridge, MA: Cambridge University Press.
- Wesley, S. S. (1989). Background data subgroups and career outcomes: Some developmental influences on person-job matching. Unpublished doctoral dissertation, Georgia Institute of Technology, Atlanta, GA.
- White, C. S., & Alexander, P. A. (1986). Effects of training on four-year-old's ability to solve geometric analogy problems. Cognition and Instruction, 3, 261-268.
- Witt, L. A., & Beorkrem, M. N. (1989). Climate for creative productivity as a predictor of research usefulness and organizational effectiveness in an R&D organization. Creativity Research Journal, 2, 30-46.
- Yuki, G. A. (1971). Toward a behavioral theory of leadership. Organizational Behavior and Human Performance, 6, 414-440.
- Yuki, G. A. (1989). Leadership in organizations. Englewood Cliffs, NJ: Prentice-Hall.

- Zaccaro, S. J., & Collins, T. T. (1988). Excused and unexcused absenteeism in normative organizations: Effects of organizational commitment, rank, and interaction process. Group and Organization Studies, 13, 81-99.
- Zaccaro, S. J., Foti, R. J., & Kenny, D. A. (1991). Self-monitoring and trait-based variance in leadership: An investigation of leader flexibility across multiple group situations. Journal of Applied Psychology, 76(2), 308-315.
- Zaccaro, S. J., Gilbert, J., Thor, K. K., & Mumford, M. D. (in press). Leadership and social intelligence: Linking social perspectiveness and behavioral flexibility to leader effectiveness. Leadership Quarterly.
- Zechmeister, E. B., Resnick, K. M., & Markell, K. A. (1986). Training college students to assess accurately what they know and don't know. Human Learning, 3-20.